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12 Fluid Mechanics 652
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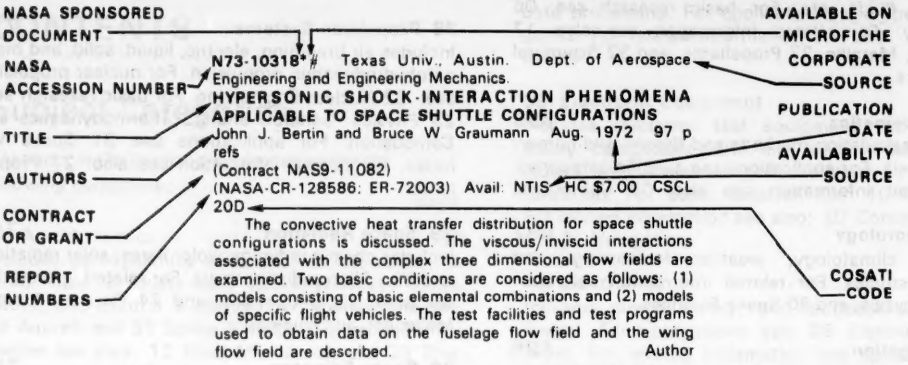
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The convective heat transfer distribution for space shuttle configurations is discussed. The viscous/inviscid interactions associated with the complex three dimensional flow fields are examined. Two basic conditions are considered as follows: (1) models consisting of basic elemental combinations and (2) models of specific flight vehicles. The test facilities and test programs used to obtain data on the fuselage flow field and the wing flow field are described. Author

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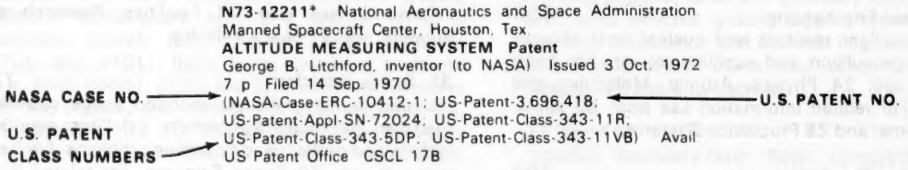
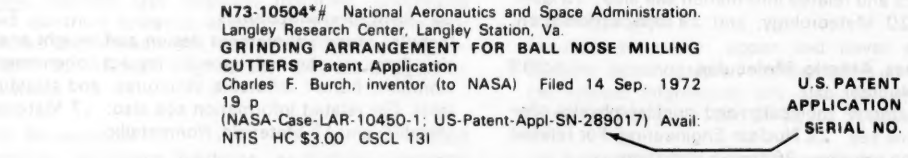
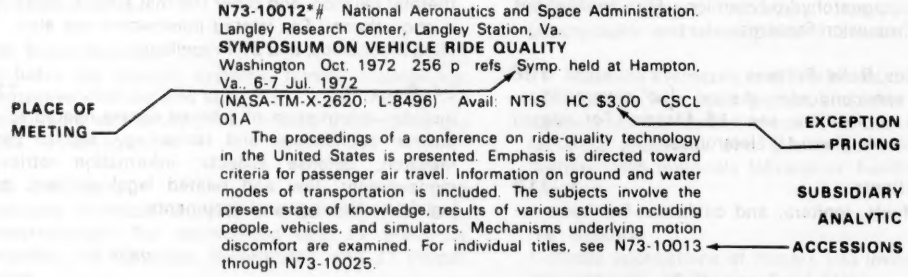

NASA CASE NO.
U.S. PATENT CLASS NUMBERS
U.S. PATENT NO.
N73-12211* National Aeronautics and Space Administration Manned Spacecraft Center, Houston, Tex.
ALTITUDE MEASURING SYSTEM Patent
George B. Litchford, inventor (to NASA) Issued 3 Oct. 1972 7 p Filed 14 Sep. 1970
(NASA-Case-ERC-10412-1; US-Patent-3,696,418; US-Patent-Appl-SN-72024; US-Patent-Class-343-11R; US-Patent-Class-343-5DP; US-Patent-Class-343-11VB) Avail US Patent Office CSCL 17B

PATENT APPLICATION CITATION


U.S. PATENT APPLICATION SERIAL NO.
N73-10504*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
GRINDING ARRANGEMENT FOR BALL NOSE MILLING CUTTERS Patent Application
Charles F. Burch, inventor (to NASA) Filed 14 Sep. 1972 19 p
(NASA-Case-LAR-10450-1; US-Patent-Appl-SN-289017) Avail: NTIS HC $3.00 CSCL 13I

PRIMARY ANALYTIC CITATION AND ABSTRACT


PLACE OF MEETING
EXCEPTION PRICING
SUBSIDIARY ANALYTIC ACCESSIONS
N73-10012*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SYMPOSIUM ON VEHICLE RIDE QUALITY
Washington Oct. 1972 256 p refs Symp. held at Hampton, Va., 6-7 Jul. 1972
(NASA-TM-X-2620; L-8496) Avail: NTIS HC $3.00 CSCL 01A
The proceedings of a conference on ride-quality technology in the United States is presented. Emphasis is directed toward criteria for passenger air travel. Information on ground and water modes of transportation is included. The subjects involve the present state of knowledge, results of various studies including people, vehicles, and simulators. Mechanisms underlying motion discomfort are examined. For individual titles, see N73-10013 through N73-10025.

SUBSIDIARY ANALYTIC CITATION

PRIMARY ANALYTIC ACCESSION AND LOCATION OF FULL CITATION AND ABSTRACT
PAGES IN PRIMARY REPORT
N73-10014* Douglas Aircraft Co., Inc., Long Beach, Calif.
AN AIRCRAFT MANUFACTURER'S APPROACH TO RIDEABILITY CRITERIA
R. C. OMassey, H. Leve, and J. G. Gaume *In* NASA. Langley Res. Center Symp. on Vehicle Ride Quality Oct. 1972 p 23-49 refs (For availability see N73-10012 01-02)
CSCL 01A

VOLUME 11 NUMBER 6 / MARCH 23, 1973

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbomachinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N73-14977# Pisa Univ. (Italy). School of Engineering.
ON SOME EXPERIMENTAL ACTIVITIES OF THE AERONAUTICAL INSTITUTE OF THE UNIVERSITY OF PISA IN THE FIELD OF APPLIED AERODYNAMICS [SU ALCUNE ATTIVITA SPERIMENTALI DELL' ISTITUTO DI AERONAUTICA DELL' UNIVERSITA DI PISA NEL CAMPO DELLA AERODINAMICA APPLICATA]
G. Barsotti, C. Casarosa, A. DelPuglia, and A. Salvetti 1969 82 p refs In ITALIAN *Its* Ser. 28a
(Publ-1352; Rept-24) Avail: NTIS HC $6.25

The research is reported on air transport problems using STOL and VTOL aircraft. The principle characteristics of a STOL model, and the simulation technology are described along with the construction problems. The aerodynamic balance results are discussed. Trans. by F.O.S.

N73-14978# National Aerospace Lab., Tokyo (Japan).
EXPERIMENTAL STUDY ON THE HYPERSONIC AERODYNAMIC CHARACTERISTICS OF SPHERICALLY-BLUNTED CONES BY THE GUN TUNNEL
Kunio Soga and Nobuyuki Onodera May 1972 16 p refs In JAPANESE; ENGLISH summary
(NAL-TR-280) Avail: NTIS HC $3.00

The drag of a series of spherically-blunted cones made up with three classes of half-vertex angle and five kinds of nose bluntness are measured using the force balance in a hypersonic flow obtained by use of the gun tunnel. The flow Mach number and Reynolds number, based on the model length, are 13.6 and 12x100,000 and 2.4x100,000 respectively. The measured drag is corrected for source flow effect using the measured free-stream Mach number distribution around the model, because it is measured in a flow obtained by a conical hypersonic nozzle and comprises the effect. The viscous effect is also evaluated by the method treated in this paper, in order to compare with results of theoretical inviscid drag. The pressure distribution over a blunted cone in inviscid hypersonic flow, which is obtained from the experimental results of drag of the blunted cones, is compared with results of the inviscid hypersonic theory and other experiments. Author

N73-14979# National Aerospace Lab., Tokyo (Japan).
TRANSIENT HYPERSONIC LEADING-EDGE FLOW
Katsuhisa Koura Jul. 1972 9 p refs In JAPANESE; ENGLISH summary
(NAL-TR-289T) Avail: NTIS HC $3.00

The transient hypersonic sharp-leading-edge problem in the kinetic regime is studied using the Monte Carlo method. A semi-infinite plate with a sharp leading edge is instantly inserted into a hypersonic uniform stream, at zero angle of attack. The flow field has been obtained for Maxwellian molecules and a diffusely-reflecting cold wall. The number density indicates an initial rarefaction in the vicinity of the plate and the formation of a shock wave away from the plate. Temperature overshoot over the steady-state value in the vicinity of the plate is observed, which was found in the Couette flow problem. The kinetic regime achieves the statistical steady state in 20 mean collision times for the collision of a body molecule with a free-stream molecule. Author

N73-14980# Research Inst. of National Defence, Stockholm (Sweden).
A PROGRAM FOR EVALUATION OF AERODYNAMIC COEFFICIENTS FROM DATA OF THE OSCILLATORY MOTION FOR A ROTATION STABILIZED PROJECTILE
Tomas Moll Jun. 1971 63 p In SWEDISH
(FOA-2-C-2478-44) Avail: NTIS HC $5.25

A method for studying the trajectory of a projectile consists of allowing projectiles to pass through a number of paper screens arranged perpendicularly to the direction of fire, from which the holes indicate the values of the firing angle and orientation. This program interprets such angle data and calculates from it certain possible aerodynamic coefficients which appear in the differential equation system for determination of a projectile's movement. Author

N73-14981*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AIRFOIL SHAPE FOR FLIGHT AT SUPERSONIC SPEEDS Patent Application
Richard T. Whitcomb, inventor (to NASA) Filed 9 Nov. 1971 27 p
(NASA-Case-LAR-10585-1; US-Patent-Appl-SN-197183) Avail: NTIS HC $3.50 CSCL 01A

An airfoil is reported that has an upper surface shaped to control flow accelerations and pressure distribution over the upper surface to prevent separation of the boundary layer due to shock wave formulation at high subsonic speeds well above the critical Mach number. A highly cambered trailing edge section improves overall airfoil lifting efficiency. NASA

N73-14982*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SUMMARY OF DESIGN AND BLADE-ELEMENT PERFORMANCE DATA FOR 12 AXIAL-FLOW PUMP ROTOR CONFIGURATIONS
Max J. Miller (Iowa State Univ. of Sci. and Technol.), Theodore H. Kiishi (Iowa State Univ. of Sci. and Technol.), George K. Serovy (Iowa State Univ. of Sci. and Technol.), Donald M. Sandercock, and Werner R. Britsch Washington Jan. 1973 217 p refs
(NASA-TN-D-7074; E-6624) Avail: NTIS HC $3.00 CSCL 01A

A collection of noncavitating blade-element performance data for 12 axial-flow pump rotor configurations is presented in tabular form. Rotor design philosophy, test apparatus and procedure, and data reduction and evaluation are discussed. A data storage

and recall computer program is described. All but one of the rotor configurations considered were composed of double-circular-arc blade sections and were designed for high inlet relative flow angles. Hub-tip radius ranged from 0.40 to 0.90. Author

N73-14983*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE OF A SINGLE-STAGE AXIAL-FLOW TRANSONIC COMPRESSOR STAGE WITH A BLADE TIP SOLIDITY OF 1.7
Royce D. Moore and Lonnie Reid Washington Dec. 1972 113 p refs
(NASA-TM-X-2658; E-6730) Avail: NTIS HC $3.00 CSCL 20D

The overall and blade-element performance of a transonic compressor stage is presented over the stable operating range at rotative speeds from 50 to 100 percent of design speed. Stage peak efficiency of 0.784 was obtained at a weight flow of 28.6 kilograms per second and a pressure ratio of 1.706. Stall margin at design speed was 11.4 percent. The peak efficiency being significantly less than design efficiency was attributed to: (1) the stator loss and the radial gradient of losses being much higher than design, (2) the losses and blockages associated with the rotor part-span dampers not being incorporated into the design, and (3) mismatch of the rotor and stator blade elements. Author

N73-14984*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
PRESSURES AND TEMPERATURES ON THE LOWER SURFACES OF AN EXTERNALLY BLOWN FLAP SYSTEM DURING FULL-SCALE GROUND TESTS
Donald L. Hughes Washington Jan. 1973 34 p
(NASA-TN-D-7138; H-729) Avail: NTIS HC $3.00 CSCL 01B

Full-scale ground tests of an externally blown flap system were made using the wing of an F-111B airplane and a CF700 engine. Pressure and temperature distributions were determined on the undersurface of the wing, vane, and flap for two engine exhaust nozzles (conical and daisy) at several engine power levels and engine/wing positions. The test were made with no airflow over the wing. The wing sweep angle was fixed at 26 deg; and the angle of incidence between the engine and the wing was fixed at 3 deg; and the flap was in the retracted, deflected 35 deg, and deflected 60 deg positions. The pressure load obtained by integrating the local pressures on the undersurface of the flap, F sub p was approximately three times greater at the 60 deg flap position than at the 35 deg flap position. At the 60 deg flap position, F sub p was between 40 percent and 55 percent of the engine thrust over the measured range of thrust. More than 90 percent of F sub p was contained within plus or minus 20 percent of the flap span centered around the engine exhaust centerline with both nozzle configurations. Maximum temperatures recorded on the flaps were 218 C (424 F) and 180 C (356 F) for the conical and daisy nozzles, repectively. Author

N73-14985*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOME OBSERVED EFFECTS OF PART-SPAN DAMPERS ON ROTATING BLADE ROW PERFORMANCE NEAR DESIGN POINT
Genevieve M. Esgar and Donald M. Sandercock Washington Jan. 1973 27 p refs
(NASA-TM-X-2696; E-7067) Avail: NTIS HC $3.00 CSCL 01A

Detailed measured radial distributions of flow parameters for eight rotors with part-span dampers are used to study the effects of dampers on rotor performance and flow parameters at near design operation. All rotors had a blade tip diameter of about 20 in. and operated at a blade tip speed of about 1400 ft/sec. Several examples demonstrate that, when the local loss variations in the damper flow region are included in an aerodynamic design or analysis procedure, the computed spanwise distributions of flow parameters compare closely with measured distributions. Author

N73-14986# National Aerospace Lab., Tokyo (Japan).
AN APPROXIMATE CALCULATION METHOD OF INCOMPRESSIBLE, TURBULENT WAKES BEHIND AEROFOILS - SYMMETRICAL WAKE FLOW CASE
Youji Ishida Jul. 1972 14 p refs In JAPANESE; ENGLISH summary
(NAL-TR-292) Avail: NTIS HC $3.00

An approximate method of calculating the development of incompressible, symmetrical turbulent wake flows downstream of airfoils is presented. In this method, the integral method using the momentum integral equation and the energy integral equation is applied. New models for the mean-velocity and the mixing-length distributions across the wake are worked out which properly describe the change of the flow characteristics from the boundary-layer type on the aerofoil surface to that of the wake far downstream. In the model for the velocity distribution which is based on Coles' two-layer model, it is assumed that the wake component of the mean velocity at the trailing edge is kept unchangeable, and only the wall component at the trailing edge changes in the new inner layer with the distance from the trailing edge. The mean-velocity distribution is given as a one-parameter family of curves by the above model, and the streamwise variation of the parameter, together with the wake thickness is determined by way of the two integral equations mentioned above. The external inviscid stream velocity at the edge of the wake flow must be given in advance. Author

N73-14987# Defence Research Establishment Valcartier (Quebec).
METHODS FOR COMPUTING DRAG COEFFICIENTS FROM BALLISTIC RANGE DATA USING THE APL SYSTEM
M. Cloutier Sep. 1972 25 p
(Proj. 97-01-19)
(DREV-TN-2027/72) Avail: NTIS HC $3.25

Three methods for computing drag coefficients of models launched in ballistic ranges are described. In addition to being fast and versatile, the methods can yield results having similar accuracy to the initial data, even in cases where the drag coefficient varies significantly with Mach number. A listing of the involved programs is given, together with some examples of calculation. Author

N73-14988*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PREDICTION OF STATIC AERODYNAMIC CHARACTERISTICS FOR SPACE-SHUTTLE-LIKE AND OTHER BODIES AT ANGLES OF ATTACK FROM 0 DEG TO 180 DEG
Leland H. Jorgensen Washington Jan. 1973 43 p refs
(NASA-TN-D-6996; A-4500) Avail: NTIS HC $3.00 CSCL 01A

An engineering-type procedure is presented for computing normal-force, axial-force, and pitching-moment coefficients for bodies at angles of attack from 0 deg to 180 deg. The procedure is ideally suited for estimating the aerodynamic characteristics of space shuttle booster-like bodies because of the wide range of angles of attack, Mach numbers, and Reynolds numbers to be encountered. The analytical formulas, plots, and references given are also applicable for shuttle orbiter, missile, and aircraft-like bodies of both circular and noncircular cross section. The method for computing normal-force and pitching-moment coefficients is based upon the original proposal of Allen that the crossflow or lift distribution over a body can be expressed as the sum of slender-body potential term and an empirical viscous crossflow term. Although experimental data from which to verify the procedure at very high angles of attack are extremely limited, the comparisons made thus far of computed with experimental results are good. In this report the procedure has been shown to be capable of predicting reasonably well the experimental variation of C sub N, C sub A, C sub m, and x sub ac/l with angle of attack for nine bodies of revolution at a free-stream Mach number of 2.86. Author

N73-14989*# General Dynamics/Convair, San Diego, Calif.
STEADY INVISCID TRANSONIC FLOWS OVER PLANAR AIRFOILS: A SEARCH FOR A SIMPLIFIED PROCEDURE
R. Magnus and H. Yoshihara Washington NASA Jan. 1973 58 p refs
(Contract NAS2-6377)

(NASA-CR-2186) Avail: NTIS HC $3.00 CSCL 01A

A finite difference procedure based upon a system of unsteady equations in proper conservation form with either exact or small disturbance steady terms is used to calculate the steady flows over several classes of airfoils. The airfoil condition is fulfilled on a slab whose upstream extremity is a semi-circle overlaying the airfoil leading edge circle. The limitations of the small disturbance equations are demonstrated in an extreme example of a blunt-nosed, aft-cambered airfoil. The necessity of using the equations in proper conservation form to capture the shock properly is stressed. Ability of the steady relaxation procedures to capture the shock is briefly examined. Author

N73-14990# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung Aeroelastik.

CALCULATION OF THE UNSTEADY PRESSURE DISTRIBUTIONS ON HARMONICALLY OSCILLATING SLENDER CRUCIFORM WING AND CYLINDRICAL BODY COMBINATIONS [BERECHNUNG DER INSTATIONAEREN DRUCKVERTEILUNG AN HARMONISCH SCHWINGENDEN KREISZYLINDRISCHEN FLUGKOERPERN MIT KREUZFOERMIG ANGEORDNETEN FLUEGELN ODER LEITFLAECHEN]

K. L. Chao Oct. 1971 97 p refs In GERMAN; ENGLISH summary

(DLR-FB-71-87; AVA-FB-7150) Avail: NTIS HC $7.00; DFVLR, Porz, West Ger. 28,80 DM

The theoretical relations for an analytical determination of the pressure distributions on harmonically oscillating slender cruciform wing and cylindrical body combinations in compressible flow based upon the Slender Body Theory are presented. For the analytical solution of the Laplace equation, the method of conformal mapping has been applied, where the cross-section geometry is transformed into a straight line. The mutual interference effects of the cruciform wings and the influence of the fuselage body are investigated in detail for heaving, pitching, and rolling oscillations. Author (ESRO)

N73-14991# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung Aerodynamik.

INFLUENCE OF THE TRAILING EDGE SHAPE ON THE DRAG OF A RECTANGULAR WING IN THE MACH NUMBER RANGE FROM Ma=0.5 TO 2.2 [DER EINFLUSS DER HINTERKANTENFORM AUF DEN WIDERSTAND EINES RECHTECKFLUEGELS IM MACHZAHLBEREICH VON Ma = 0,5 BIS 2,2]

M. Tanner Oct. 1971 91 p refs In GERMAN; ENGLISH summary

(DLR-FB-71-85; AVA-FB-7149) Avail: NTIS HC $6.75; DFVLR, Porz, West Ger. 28,80 DM

Drag and lift measurements were performed on two rectangular wings with an aspect ratio of Lambda = 2 in the Mach number range from 0.5 to 2.2. One wing had a sharp trailing edge and the other a blunt trailing edge. The shape and thickness of the blunt trailing edge were varied. The drag of the wing with a blunt trailing edge was considerably reduced by using a broken trailing edge shape. The total drag was split into its components to show the magnitude of the various drag components. Author (ESRO)

N73-14992# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).

FURTHER DEVELOPMENT AND APPLICATION OF THE SUBSONIC PANEL METHOD [WEITERENTWICKLUNG UND ANWENDUNG DES UNTERSCHALL-PANEL-VERFAHRENS]

Werner Kraus 20 Sep. 1972 39 p refs In GERMAN Presented at the 5th DGLR Ann. Meeting, Berlin, 4-6 Oct. 1972

(MBB-UFE-889-72-O; DGLR-Paper-72-105) Avail: NTIS HC $4.00

The development is described of a subsonic numerical panel method for calculating the flow around arbitrarily shaped bodies, based on potential flow. The application of this method is demonstrated by the following examples: delta wing, reentry body, body-wing configuration, exterior two-dimensional flow, water drop trajectories for ice formation determination, three-dimensional exterior flow and wing wakes, and wing combinations. Author (ESRO)

N73-14993# Alpha Research, Inc., Santa Barbara, Calif.

FLIGHT DYNAMICS AND DISPERSION CHARACTERISTICS OF S-CURVE AND ROLL-THROUGH-ZERO BOMBLETS Final Report, Jun. 1970 - Sep. 1972

James E. Brunk Eglin AFB, Fla. AFATL Sep. 1972 42 p refs

(Contracts F08635-70-C-0012; F08635-71-C-0089; AF Proj. 2547)

(AD-749956; AFATL-TR-72-181) Avail: NTIS CSCL 19/4

Two new ballistic-type self-dispersing bomblets which utilize passive control of the radial orientation of the trimmed lift force are described and the motion of these bomblets as determined by simplified theory and by exact six-degree-of-freedom simulation is discussed. Some of the unique aerodynamic characteristics of these bomblets as determined from wind tunnel tests are also described. Impact pattern predictions, using the Monte Carlo method, show that properly designed S-Curve and roll-through-zero bomblets can achieve large uniform patterns for low-altitude high-speed delivery conditions; however, configurational asymmetries, if not suitably restricted, can significantly modify the bomblet performance. Author (GRA)

N73-14994# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).

DRAG COEFFICIENT OF CONES Final Report, 1 Mar. 1970 - 30 Nov. 1971

John F. Wendt May 1972 54 p refs

(Contract F61052-70-C-0018; AF Proj. 1366)

(AD-750042; AFFDL-FXG-TM-72-23) Avail: NTIS CSCL 16/3

The objective was to provide experimental values for cone drag coefficients in the near free molecule and transitional flow regimes including an examination of the effects of Mach number, wall speed ratio, bluntness, and specific heat ratio. A modulated force probe with a sensitivity in the microgram range was employed to measure the hypersonic drag forces on 9 degrees half-angle cones. A knowledge of the flow properties in the free jet employed for this study permitted the calculation of cone drag coefficients. The resulting values cover the flow regimes from near-free-molecular to transitional. The experimental data are presented as a function of the dimensionless parameters wall Re number, and free-stream Knudsen number.

Author (GRA)

N73-14995# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INFLUENCE OF AN ANNULAR JET FLOWING FROM THE PLANE OF A WING ON THE AERODYNAMIC CHARACTERISTICS OF A WING MOVING NEAR AN INTERFACE

L. F. Kalitievskii and Yu. F. Usik 1 Sep. 1972 12 p refs Transl. into ENGLISH from Teplo. Massoperenos (Minsk), no. 11, 1969 p 431-435

(AD-750933; FTD-HT-23-785-72) Avail: NTIS CSCL 01/1

The article presents some results of research on the aerodynamic characteristics of a wing moving close to an interface with the presence of an annular jet flowing from the wing surface and impinging on a screen. A similar problem arises during research on the aerodynamic characteristics of a wing-like apparatus on an air cushion. Author (GRA)

N73-15004 Technische Hochschule, Stuttgart (West Germany). Inst. fuer Aerodynamik und Gasdynamik.

DESIGN OF AIRFOILS WITH HIGH LIFT AT LOW AND MEDIUM SUBSONIC MACHNUMBERS

F. X. Wortmann *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 9 p refs (For availability see N73-14998 06-02)

N73-15007 Douglas Aircraft Co., Inc., Santa Monica, Calif.

AERODYNAMICS IN HIGH LIFT AIRFOIL SYSTEMS

A. M. O. Smith *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 27 p refs (For availability see N73-14998 06-02)

N73-15018 Royal Aircraft Establishment, Bedford (England).

THE DYNAMIC ANALYSIS OF BUFFETING AND RELATED PHENOMENA

J. G. Jones *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 10 p refs (For availability see N73-14998 06-02)

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N73-14996 International Civil Aviation Organization, Montreal (Quebec).

LEXICON OF TERMS USED IN CONNEXION WITH INTERNATIONAL CIVIL AVIATION. VOLUME 1: VOCABULARY

1971 268 p In ENGLISH, FRENCH, and SPANISH 2 Vol. (Doc-8800-Vol-1) Copyright. Avail: Issuing Activities

A number of terms, in English, French and Spanish, which are relevant to the work of the International Civil Aviation Organization (ICAO) are collected. In addition to strictly aeronautical terminology related to aircraft and their operation, the vocabulary presented here extends to various allied fields to which an important part of ICAO's work is devoted. Volume I contains a trilingual vocabulary and five appendices, as well as two alphabetical reference indexes, one in French and one in Spanish. Author

N73-14997 International Civil Aviation Organization, Montreal (Quebec).

LEXICON OF TERMS USED IN CONNEXION WITH INTERNATIONAL CIVIL AVIATION. VOLUME 2: DEFINITIONS

1971 98 p In ENGLISH, FRENCH, and SPANISH 2 Vol. (Doc-8800-Vol-2) Copyright. Avail: Issuing Activity

A list of ICAO approved definitions for civil aviation terminology are presented in English, French, and Spanish. Arranged in the English alphabetical order, they are assigned consecutive index numbers. References appearing in the center column indicate the sources of the definitions. Author

N73-14998# Advisory Group for Aerospace Research and Development, Paris (France).

FLUID DYNAMICS OF AIRCRAFT STALLING

Nov. 1972 342 p refs Partly in ENGLISH and partly in FRENCH Presented at Fluid Dyn. Panel Specialists Meeting, Lisbon, 25-28 Apr. 1972

(AGARD-CP-102) Avail: NTIS HC $19.25

The proceedings of a conference on the fluid dynamics of aircraft stalling are presented. The subjects discussed are: (1) two dimensional laminar separation bubbles, (2) turbulent boundary layers flows, (3) aerodynamics of high lift airfoil systems, (4) low speed stalling of wings with high lift devices, (5) stall characteristics of various military aircraft, and (6) airflow separation and buffet onset during fighter aircraft maneuvers. For individual titles, see N73-14999 through N73-15020.

N73-14999 Queen Mary Coll., London (England). Dept. of Aeronautical Engineering.

ROLE OF FLUID DYNAMICS IN AIRCRAFT STALL AND POSTSTALL GYRATIONS

G. J. Hancock *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 16 p refs (For availability see N73-14998 06-02)

The airworthiness requirements for stall and post stall behavior of an aircraft are reviewed. The definition of stall as the limiting condition for normal flight operations is established. The distinct dynamic and aerodynamic contributions to a stall maneuver and post stall gyration are described. The pilot's influence is assessed and some implications on airframe design are outlined. The effects of flow separation on wings, the control of flow separation, and the role of model experiments are reported. Author

N73-15000 Technische Hogeschool, Delft (Netherlands). Dept. of Aeronautical Engineering.

SOME RESEARCH ON TWO DIMENSIONAL LAMINAR SEPARATION BUBBLES c12

E. Dobbinga, J. L. VanIngen, and J. W. Kooi *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 8 p refs (For availability see N73-14998 06-02)

Empirical information on the angle at which the separation streamline leaves the wall, in wall flow, was obtained. The laminar part of separation bubbles in two dimensional incompressible flow was calculated for the following conditions: (1) plane stagnation point boundary layer flow, (2) flow around a cylinder 70 millimeters in diameter, (3) flow around a cylinder 400 milimeters in diameter, (4) a long cylinder, axially aligned with the wind, separation induced by a forward facing step, (5) a short flat plate with separation induced by auxiliary airfoils, (6) a short flat plate with separation induced by a forward facing step, and (7) a long flat plate with separation induced by a forward firing step. The measured angles are plotted as a function of the Reynolds number at separation. Author

N73-15001 Centre National de la Recherche Scientifique, Meudon (France).

THEORETICAL AND EXPERIMENTAL RESEARCH OF TAKE OFF DRAG DEFORMATION OF LOCAL SURFACE [RECHERCHES THEORIQUES ET EXPERIMENTALES SUR LES DECOLLEMENTS LIES A UNE DEFORMATION LOCALE DE SURFACE] c12

S. Burnel, G. B. Diep, P. Gougat, and B. Prunet-Foch *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 11 p refs In FRENCH (For availability see N73-14998 06-02)

A theoretical and experimental study was made of incompressible flow during takeoff. Velocity profiles were measured in the boundary layer by hot wire anemometers, and the signals obtained used to determine frequency distribution. Static pressure distribution on the inner surface was also determined. A plate containing a cavity was used to measure deformation on the hollow ledge. Spectral density fluctuations in velocity permits the measurement of natural instabilities in the boundary layer. The instabilities are correlated with exterior speed. Author

N73-15002 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

AIRFOIL STALL PREDICTION IN INCOMPRESSIBLE FLOW c12

Michel Vincent DePaul *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 15 p refs In FRENCH; ENGLISH summary (For availability see N73-14998 06-02)

A calculation method is proposed to calculate the small separation zones which are initiated near the leading edge of an airfoil at incidence. This calculation provides the details of the separation process and the maximum lift that may be obtained with a certain Reynolds number range. Author

N73-15003 Northrop Corp., Hawthorne, Calif. Aircraft Div.

PARAMETRIC STUDIES OF SEPARATING TURBULENT BOUNDARY LAYER FLOWS c12

Andrzej Wortman and W. J. Franks *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 9 p refs (For availability see N73-14998 06-02)

A new technique for the exact solutions of laminar or turbulent two- or three-dimensional boundary layer flows has been developed. The technique differs from previous approaches in the use of functional analysis to obtain exact semianalytical solutions in a small fraction of the computer time normally required for such computations. The main advantage of the semianalytical aspect of the technique is that the functional forms of the relations in the governing differential equations are retained and the use of the computer is relegated to the performance of simple quadratures and fluid properties calculations. Thus, the study of the various turbulent viscosity models is a matter of programming the model into the subroutine where such calculations are performed. A wide range of eddy viscosity relations can therefore be studied in a few parametric runs. A typical three-dimensional calculation at a point on a body requires 3 seconds of IBM 360/65 computer time, so that extensive parametric studies can be performed quickly and economically. Author

N73-15004 Technische Hochschule, Stuttgart (West Germany). Inst. fuer Aerodynamik und Gasdynamik.
DESIGN OF AIRFOILS WITH HIGH LIFT AT LOW AND MEDIUM SUBSONIC MACH NUMBERS c01
F. X. Wortmann *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 9 p refs (For availability see N73-14998 06-02)

The design of airfoils with high lift at low and medium subsonic speeds is discussed. It is stated that the maximum lift of a symmetrical airfoil at low Mach numbers can be increased from 15 to 20 percent if the airfoil nose is modified and designed to yield lower velocity peaks and less pronounced laminar separation bubbles. The performance of the airfoil at various subsonic speeds and angles of attack is described. Author

N73-15005 National Aerospace Lab., Amsterdam (Netherlands).
COMMENTS ON THE METHODS DEVELOPED AT NLR FOR CONDUCTING TWO DIMENSIONAL RESEARCH ON HIGH LIFT DEVICES
O. DeVries *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 7 p refs (For availability see N73-14998 06-02)
Avail: NTIS

Two experimental approaches for analyzing two dimensional flow on high lift devices are described. The first method consists of pressure measurements at the mid-span section of a two dimensional wing with boundary layer control at the tunnel wall-wing junctions by blowing slots. The second approach consists of potential flow calculations by means of a singularity method with a source distribution on the contour of the airfoil. This is applied with a limited number of contour points on the airfoils. The calculations are compared with the experimental results. Author

N73-15006 Avions Marcel Dassault, Saint-Cloud (France).
BLOCKAGE CORRECTIONS IN BLOWING TESTS OF EFFECTS OF TAKE-OFF [CORRECTION DE BLOCAGE DANS LES ESSAIS EN SOUFFLERIE EFFETS DES DECOLLEMENTS] c12
Jean-Ch. Vayssaire *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 22 p refs In FRENCH; ENGLISH summary (For availability see N73-14998 06-02)

The application of blockage corrections to wind tunnel test measurements made on aircraft models is discussed. The procedure corrects the velocity to infinity upstream and restores to the wall-affected aerodynamic coefficients the values which are fairly equivalent to those obtained on a model placed in an unlimited fluid stream. The corrective blockage terms which modify the reference kinetic pressure are analyzed. The terms are affected by volume, wake, and separations. Each of them is usable in incompressible, compressible, two dimensional, and three dimensional flows on whole or half models. Author

N73-15007 Douglas Aircraft Co., Inc., Santa Monica, Calif.
AERODYNAMICS IN HIGH LIFT AIRFOIL SYSTEMS c01
A. M. O. Smith *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 27 p refs (For availability see N73-14998 06-02)

The aerodynamic processes that occur in flow past unpowered multi-element airfoils in the high lift attitude are discussed. Charts showing permissible pressure recovery for retarded flows are presented. The best possible load carrying pressure distributions are described, as well as airfoils that develop the maximum possible lift in fully attached flow. It is shown that for a given optimum type of pressure distribution a two-element airfoil can develop more lift than a single element airfoil shaped to develop the same pressure distribution. Author

N73-15008 Royal Aircraft Establishment, Farnborough (England).
THE LOW SPEED STALLING OF WINGS WITH HIGH LIFT DEVICES
D. N. Foster *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 12 p refs (For availability see N73-14998 06-02)

The mechanism of the stall of wing sections with high-lift devices in two dimensional flow is discussed. The similarities to the stalling mechanism for single airfoils, and the differences which arise as a result of the close proximity of the multiple lifting elements of the wing section to each other are described. The effect of sweepback is discussed for an infinite sheared wing and for a finite aspect ratio wing with high lift devices. The effects of practical features such as part-span flaps, and flap and slat support brackets, are illustrated by reference to flow patterns measured on a swept back wing. Author

N73-15009 General Dynamics/Fort Worth, Tex.
A SIMPLIFIED MATHEMATICAL MODEL FOR THE ANALYSIS OF MULTIELEMENT AIRFOILS NEAR STALL
I. C. Bhateley and R. G. Bradley *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 12 p refs (For availability see N73-14998 06-02)

Potential-flow analysis methods, based on distributed-singularity models, are adequate for the prediction of aerodynamic characteristics for 2-D multiple-airfoil systems where viscous effects are negligible. However, for analysis and design of high-lift systems where viscous effects dominate, potential-flow methods are not adequate. In order that these viscous effects may be accounted for, a method has been formulated by which a solution is obtained through analysis of an equivalent airfoil system in potential flow. The mathematical model for the equivalent system consists of a linearly varying vorticity distribution over the surface of each airfoil element and a source distribution embedded inside each airfoil element to simulate the separated wake. The boundary-layer displacement thickness is superimposed on the airfoil contour to form an equivalent airfoil surface for each element. The flow downstream of a separation point is allowed to develop as a free streamline flow with no surface boundary conditions. The mathematical model is evaluated for cases where the location of the separation point is specified from experimental data. The predicted chordwise pressure distributions are shown to correlate well with experimental data for several multiple airfoils (including leading-edge slats and trailing-edge slotted flaps) for angles of attack near stall. Author

N73-15010 Royal Aircraft Establishment, Farnborough (England).
THE EFFECT OF LEADING EDGE GEOMETRY ON HIGH SPEED STALLING
G. F. Moss, A. B. Haines (Aircraft Res. Assoc.), and R. Jordon (Aircraft Res. Assoc.) *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 16 p refs (For availability see N73-14998 06-02)

It is shown by means of an example how small modifications to the leading-edge profile of a sweptwing can result in large effects on lift performance at the stall in the higher range of subsonic speeds. The basic types of leading-edge pressure distribution for any one fixed geometry over the whole range of subsonic speed are discussed and the difficulties in designing a profile shape which gives a satisfactory compromise in wing performance across this range is emphasized. Two types of variable-geometry device at the leading edge are discussed, each of which allows some degree of optimization in the shape required for good aerodynamic performance across the range of Mach numbers. Author

N73-15011 Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio. Control Criteria Branch.
A PRACTICAL LOOK AT THE STALL AND HIGH LIFT OPERATION OF EXTERNALLY BLOWN FLAP STOL TRANSPORT CONFIGURATIONS
David J. Moorehouse *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 13 p refs (For availability see N73-14998 06-02)

Some practical design aspects of the stall of powered-lift aircraft having externally blown flaps are considered. Techniques are examined for predicting the increment in maximum lift coefficient due to power. Numerical results are presented for an existing theory based on the assumption of a leading-edge stall and the use of basic jet-flap theory. The accuracy of the theory is better than might be expected, and an empirical factor is added to produce good correlation with measured values. A completely empirical approach is shown to be effective as a simple technique to provide quick approximations to the increment in maximum lift coefficients. Author

N73-15012 British Aircraft Corp., Warton (England). Aerodynamics Dept.
FLIGHT DEVELOPMENT OF THE STALLING CHARACTERISTICS OF A MILITARY TRAINER AIRCRAFT
W. D. Horsfield and G. P. Wilson *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 9 p (For availability see N73-14998 06-02)

The modifications to the Jet Provost Mk. 5 and the

Strikemaster 167 aircraft to improve the stall warning characteristics are reported. The procedures for obtaining the desired characteristics of a clearly marked stall with adequate warning of the approach without penalty on maximum lift and without involving large aircraft modifications are described. Diagrams and illustrations of the final configurations are included. Author

N73-15013 General Dynamics/Fort Worth, Tex.
STALL/POST-STALL CHARACTERISTICS OF THE F-111 AIRCRAFT
Charles A. Anderson *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 9 p (For availability see N73-14998 06-02)

The stall/post-stall characteristics of the F-111 aircraft are described. The characteristics have been defined on the basis of wind tunnel tests, free-flight model tests, radio controlled drop model tests, analytical analysis, and flight tests. The extent of each type of testing is discussed and a summary of the results is presented. A discussion of the regression techniques used to obtain aerodynamic derivatives in the high angle of attack simulator is included. Author

N73-15014 Hawker Siddeley Aviation, Ltd., Kingston upon Thames (England).
POST-STALL AERODYNAMICS OF THE HARRIER GR1
Cliff L. Bore *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 7 p refs (For availability see N73-14998 06-02)

The post-stall aerodynamics of the Harrier GR1 aircraft are discussed. The requirement to achieve high usable lift coefficients during maneuvering at subsonic speeds, without incurring a weight penalty for leading edge devices is described. The resulting characteristics of boundary layer separation after buffet onset are analyzed. The effects of arrays of fences and vortex generators are examined. Author

N73-15015 Royal Netherlands Aircraft Factories Fokker, Amsterdam.
AERODYNAMICS OF WING STALL OF THE FOKKER F28
Tj. Schuringa *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 5 p (For availability see N73-14998 06-02)

The aerodynamic development of the F28 wing with regard to the stall are described. First, the investigation in the wind tunnel is reported, dealing with the influence of boundary layer fences, secondly the correlation with flight tests is presented. It may be concluded that, apart from minor modifications, satisfactory agreement was found between wind tunnel and flight test results. Author

N73-15016 Boeing Co., Seattle, Wash.
PREDICTING THE LOW SPEED STALL CHARACTERISTIC OF THE BOEING 747
John K. Wimpress *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 9 p (For availability see N73-14998 06-02)

The pre-flight estimates for the Boeing 747, based on wind tunnel data obtained at a Reynolds Number of approximately 1 million, are presented. These test results were adjusted to full scale flight values using correlation factors developed from other Boeing transport airplanes. As an indepedent check, high lift data were obtained in a pressurized wind tunnel up to a Reynolds Number of 7.5 million and extrapolated to the full scale value of 40 million. Flight results show that the correlation factors were moderately successful in predicting stall speeds. Also, extrapolating the pressure tunnel data to full scale Reynolds Numbers predicted the flight value of maximum lift coefficient with reasonable accuracy. The wind tunnel data at all Reynolds Numbers predicted satisfactory handling characteristics throughout the stall that were confirmed during flight testing. Author

N73-15017 Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio. Aeromechanics Branch.
ON AIRFLOW SEPARATION AND BUFFET ONSET DURING FIGHTER AIRCRAFT MANEUVERING
Peter J. Butkewicz *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 10 p refs (For availability see N73-14998 06-02)

An experimental flight test program was sponsored to determine the buffet characteristics of four high performance aircraft. The aircraft were flown in transonic maneuvers encountering conditions of buffeting onset through heavy buffeting. The aircraft were instrumented with accelerometers, wing root strain gages, wing static pressure taps, and one wing was tufted for flow visualization photographs. The aircraft were flown in the baseline configuration as well as with various deflections of leading and trailing edge flaps. The results of the flight test program, the effects of mechanical high lift devices on buffet, and some wind tunnel/flight test correlations are presented. Author

N73-15018 Royal Aircraft Establishment, Bedford (England).
THE DYNAMIC ANALYSIS OF BUFFETING AND RELATED PHENOMENA c01
J. G. Jones *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 10 p refs (For availability see N73-14998 06-02)

A dynamic analysis of buffeting and related aerodynamic phenomena is presented. The closed-loop interaction between the fluid motion, involving separated flow, and the motion of the wing surface is analyzed. The problem of formulating an appropriate theoretical model for buffeting is discussed. An analogous problem concerning the choice of appropriate analytical models for oscillatory rigid-body motion, known as wing rocking, is examined. Buffeting measurements obtained from flight tests of small combat trainer aircraft are included. Author

N73-15019* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MANEUVER AND BUFFET CHARACTERISTICS OF FIGHTER AIRCRAFT
Edward J. Ray (McDonnell Aircraft Co., St. Louis), Linwood W. McKinney, and Julian G. Carmichael *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 11 p refs (For availability see N73-14998 06-02)

The high subsonic and transonic characteristics of fighter aircraft and the factors affecting aerodynamic boundaries, such as maximum obtainable lift, buffet onset, pitchup, wing rock, and hose slice are discussed. Investigations were made using a general research configuration which encompassed a systematic matrix of wing design parameters. These results emphasized the sensitivity to section and planform geometry at the selected design point. The incorporation of variable-wing-geometry devices in the form of leading-edge slats or flaps was shown in a number of flight and wind-tunnel studies to provide controlled flow over a wide range of flight conditions and substantial improvements in maneuver capabilities. Additional studies indicated that the blending of a highly swept maneuver strake with an efficient moderately swept wing offers a promising approach for improving maneuver characteristics at high angles of attack without excessive penalties in structural weight. Author

N73-15020 Naval Air Systems Command, Washington, D.C.
AERODYNAMIC DESIGN AND FLIGHT TEST OF US NAVY AIRCRAFT AT HIGH ANGLES OF ATTACK
W. R. Burris and J. T. Lawrence *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 10 p refs (For availability see N73-14998 06-02)

The aerodynamic design, engineering development, and flight testing of naval aircraft at high angles of attack are discussed. The flight regime beginning with buffet onset and proceeding up through departure from controlled flight is investigated. Post-stall gyrations and spin recovery are analyzed. The importance of the design process for low speed flight stability is emphasized. Author

N73-15021# Department of Civil Aviation, Melbourne (Australia). Airways Engineering Research and Development Section.
MEASUREMENT OF SONIC BOOM FROM CONCORDE-002 AUSTRALIA 1972
M. E. L. Williams and N. W. Page Aug. 1972 44 p refs (R/D-896) Avail: NTIS HC $4.25

Measurements were made of the sonic boom produced by the Concorde 002 aircraft during two supersonic flights. For both flights the aircraft was cruising at about Mach 2 at an altitude of about 52,000 feet. The overpressures measured indicated that, for a signature undistorted by atmospheric turbulence, the maximum overpressure on the ground was about 90 Pa for both flights. Ray paths and ground overpressure distributions were calculated using atmospheric data measured for each flight. Author

N73-15022# National Aerospace Lab., Tokyo (Japan).
TRANSONIC AND SUPERSONIC FLUTTER CHARACTERISTICS OF LOW ASPECT RATIO AND SWEPTBACK THIN CANTILEVER WINGS
Eiichi Nakai, Toshiyuki Morita, Takao Kikuchi, Minoru Takahashi, and Masatoshi Tookubo May 1972 17 p refs In JAPANESE; ENGLISH summary
(NAL-TR-288) Avail: NTIS HC $3.00

The transonic and supersonic flutter characteristics of thin cantilever wings with sweepback angles of 42.5 deg at the leading edge and 10 degrees at the trailing edges an aspect ratio of 1.344, and a taper ratio of 0.63 are presented. The experiments were conducted in a transonic blowdown wind tunnel at subsonic and supersonic speeds. The flutter boundary of the stiffness-altitude coefficients is characterized by having a maximum value near Mach 1.05 in the transonic speed range and by increasing in value with an increase of Mach number in the supersonic range. Author

N73-15023# Aeronautical Research Labs., Melbourne (Australia).
DYNAMIC TESTS OF A YIELDING SEAT BELT SYSTEM
S. R. Sarrailhe Jun. 1972 39 p refs
(ARL/SM-340) Avail: NTIS HC $4.00

The performance of crash protective seat belts can be improved by incorporating energy absorbers to allow the system to yield at constant force. The principle can be applied to the whole system or to critical components. As upper torso restraint is desirable but strength for attachment is limited in aircraft, dynamic tests were carried out with lap/sash seat belts incorporating energy absorbers in the sash (shoulder) straps. For comparison conventional assemblies were also tested. The tests showed that with energy absorbers allowing an increase in dummy movement of five inches or less the shoulder strap forces could be reduced by 30 percent. Alternatively energy absorbers allowed an increase of 50 percent on the input deceleration without increase in shoulder strap force. It was considered that energy absorption in the seat and lap belts could allow similar improvement in these components. The load distribution between the strap and the friction force between the dummy and seat was examined and it was found that the seat force was of similar magnitude to the combined lap strap forces. Author

N73-15024# National Transportation Safety Board, Washington, D.C.
AIRCRAFT ACCIDENT PRELIMINARY REPORT, EASTERN AIR LINES, INCORPORATED, L-1011, N310EA NEAR MIAMI, FLORIDA, 29 DECEMBER 1972
11 Jan. 1973 10 p
Avail: NTIS $3.00

The conditions and circumstances existing at the time of the crash of a Lockheed L-1011 aircraft near Miami, Florida on 29 Dec. 1972 are presented. The aircraft experienced nose gear system malfunction during the approach to the airport and this problem was being investigated at the time of the crash. No statement is made concerning the cause of the accident which resulted in fatalities to five crew members and ninety-four passengers. P.N.F.

N73-15025*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ACOUSTIC PROPERTIES OF A SUPERSONIC FAN
Arthur W. Goldstein, Frederick W. Glaser, and James W. Coats Washington Jan. 1973 39 p refs
(NASA-TN-D-7096; E-6953) Avail: NTIS HC $3.00 CSCL 20A

Tests of supersonic rotors designed to reduce forward propagating pressure waves and the accompanying blade passing tones and multiple pure tones showed the wave propagation and noise reduction to have been obtained at the expense of increased noise radiation rearward. Outlet guide vanes served to muffle the noise propagating rearwards, but did not affect forward propagation at all. Author

N73-15026*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
EXCITATION, RESPONSE, AND FATIGUE LIFE ESTIMATION METHODS FOR THE STRUCTURAL DESIGN OF EXTERNALLY BLOWN FLAPS
Eric E. Ungar, K. L. Chandiramani, and J. E. Barger Oct. 1972 107 p refs
(Contract NAS1-9559-67)
(NASA-CR-112216; Rept-2469) Avail: NTIS HC $7.50 CSCL 01B

Means for predicting the fluctuating pressures acting on externally blown flap surfaces are developed on the basis of generalizations derived from non-dimensionalized empirical data. Approaches for estimation of the fatigue lives of skin-stringer and honeycomb-core sandwich flap structures are derived from vibration response analyses and panel fatigue data. Approximate expressions for fluctuating pressures, structural response, and fatigue life are combined to reveal the important parametric dependences. The two-dimensional equations of motion of multi-element flap systems are derived in general form, so that they can be specialized readily for any particular system. An introduction is presented of an approach to characterizing the excitation pressures and structural responses which makes use of space-time spectral concepts and promises to provide useful insights, as well as experimental and analytical savings. Author

N73-15027*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXTERNALLY BLOWN FLAP TRAILING EDGE NOISE REDUCTION BY SLOT BLOWING: A PRELIMINARY STUDY
D. J. McKinzie, Jr. and R. J. Burns 1973 16 p refs Presented at 11th Aerospace Sci. Meeting Tech. Display, Washington, D. C., 10-12 Jan. 1973; sponsored by AIAA
(NASA-TM-X-68172; E-7251) Avail: NTIS HC $3.00 CSCL 01B

Short takeoff and landing (STOL) aircraft using externally blown flaps (EBF) for lift augmentation develop considerable jet-flap interaction noise. A proposed method to reduce the EBF trailing edge noise is to locate a slot near the trailing edge of a flap through which low velocity secondary air is blown. Limited OASPL noise data were obtained from the interaction of the jet exhaust from a 5.08 cm diameter convergent nozzle with the trailing edge of a plate, and are presented for five slot configurations located near or at the trailing edge of the plate. Also presented are some significant jet trailing edge interaction data using a mixer nozzle with one of the slot configurations. Author

N73-15028*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
JET NOISE OF AN AUGMENTOR WING-ADVANCED SUPERSONIC TRANSPORT
Leo Franciscus Dec. 1972 12 p refs
(NASA-TM-X-68177; E-7270) Avail: NTIS HC $3.00 CSCL 01B

A preliminary mission study was made of the range and jet noise of an advanced supersonic transport (AST) employing an augmentor wing and four duct burning turbofan engines. The airplane weight and aerodynamic characteristics of the Boeing 2707-300 airplane with a gross weight of 750,000 pounds and 234 passengers was used for the study. Engine thrust was fixed at 58,000 pounds per engine and engine size was increased to obtain the required thrust at reduced power settings for jet noise reduction. Turbofan engine core noise was reduced to FAR 36 noise levels and lower by proper selection of turbine inlet temperature, bypass ratio and fan pressure ratio. The study showed that an augmentor wing can reduce the bypass jet noise sufficiently so that total noise levels below FAR 36 can be attained without significant range penalties if the augmentor wing can be designed without severe weight and performance penalties. Author

N73-15029*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OPTIMIZATION OF ENGINES FOR A COMMERCIAL MACH 0.85 TRANSPORT USING ADVANCED TURBINE COOLING METHODS
Gerald A. Kraft Nov. 1972 42 p refs
(NASA-TM-X-68173; E-7212) Avail: NTIS HC $4.25 CSCL 21E

A parametric study was made of a group of separate-flow-turbofan engines for use in advanced technology airplanes designed for a cruise Mach number of 0.85 at 40,000 feet. The three-engined airplanes were sized to carry 200 passengers

3000 nautical miles. Supercritical aerodynamics were assumed. Film-cooled turbines were used and sea-level-static turbine-rotor-inlet temperature was always 2600 F. The optimum cycle depends on the noise goal assumed. Without a noise goal the best fan pressure ratio (FPR) is about 1.90. At noise goals of FAR 36, -10 EPNdb, and -20 EPNdb, the best FPR's are 1.85, 1.76, and 1.70, respectively, at cruise. The take-off FPR's are progressively less than the cruise value as the noise goal approaches -20 EPNdb. The penalties in take-off gross weight incurred were 8.5, 19, and 64 percent at goals of FAR 36, -10 EPNdb, and -20 EPNdb, respectively. Author

N73-15030*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLAP NOISE MEASUREMENTS FOR STOL CONFIGURATIONS USING EXTERNAL UPPER SURFACE BLOWING
Robert G. Dorsch, Meyer Reshotko, and William A. Olsen 1972 39 p refs Presented at 8th Propulsion Joint Specialists Conf., New Orleans, La., 29 Nov. - 1 Dec. 1972; sponsored by AIAA and ASME
(NASA-TM-X-68167; E-7227) Avail: NTIS HC $4.00 CSCL 01B

Screening tests of upper surface blowing on externally blown flaps configurations were conducted. Noise and turning effectiveness data were obtained with small-scale, engine-over-the-wing models. One large model was tested to determine scale effects. Nozzle types included circular, slot, D-shaped, and multilobed. Tests were made with and without flow attachment devices. For STOL applications the particular multilobed mixer and the D-shaped nozzles tested were found to offer little or no noise advantage over the round convergent nozzle. High aspect ratio slot nozzles provided the quietest configurations. In general, upper surface blowing was quieter than lower surface blowing for equivalent EBF models. Author

N73-15031*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF ROTOR DESIGN TIP SEED ON AERODYNAMIC PERFORMANCE OF A MODEL VTOL LIFT FAN UNDER STATIC AND CROSSFLOW CONDITIONS
N. O. Stockman, I. J. Loeffler, and S. Lieblein 1973 32 p refs Proposed for presentation at Ann. Gas Turbine Conf., Washington, D. C., 8-12 Apr. 1973; sponsored by Am. Soc. of Mech. Engr.
(NASA-TM-X-68169; E-7230) Avail: NTIS HC $3.75 CSCL 01B

Results are presented for a wind tunnel investigation of three single VTOL lift fan stages designed for the same overall total pressure ratio at different rotor tip speeds. The stages were tested in a model lift fan installed in a wing pod. The three stages had essentially the same aerodynamic performance along the operating line. However, differences in stage thrust characteristics were obtained when a variation in back pressure was imposed on the stages by cross-flow effects and thrust-vectoring louvers. Author

N73-15032*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARATIVE PERFORMANCE OF SEVERAL SST CONFIGURATIONS POWERED BY NOISE LIMITED TURBOJET ENGINES
John B. Whitlow, Jr. Dec. 1972 67 p refs
(NASA-TM-X-68178) Avail: NTIS HC $5.50 CSCL 01B

A simplified study was made in which the mission performances of three Mach 2.7 airplane configurations were compared. Both wing loading and size of the unaugmented turbojet engines were varied at different levels of suppressor technology. The lowest gross weight and the best return on investment were obtained with an advanced arrow wing configuration when a mission range of 4200 nautical miles was specified. This comparison was made for the takeoff noise levels specified in F.A.R. 36 using retractable jet noise suppressors assumed to be capable of 15 PNdb of suppression with only a 7.5-percent thrust loss. With less advanced suppressor technology, a modified delta configuration is a close competitor of the arrow wing. Despite its good takeoff characteristics, a swing-wing configuration was too structurally heavy to be competitive at F.A.R. 36 noise levels. Engine performance and weight commensurate with engine definition in 1975 were postulated. Author

N73-15033*# Lockheed Aircraft Corp., Burbank, Calif.
STUDY OF LOAD ALLEVIATION AND MODE SUPPRESSION (LAMS) ON THE YF-12A AIRPLANE
Lester D. Edinger, Frederick L. Chenk, and Alan R. Curtis Washington NASA Dec. 1972 140 p refs Sponsored by NASA Prepared in cooperation with Honeywell, Inc., Minneapolis (Contract F33657-71-C-0021)
(NASA-CR-2158) Avail: NTIS HC $3.00 CSCL 01B

The potentials and capability for implementing a LAMS (load alleviation and mode suppression) system on the YF-12A for the purpose of flight research were evaluated. The nature of the research is to minimize the design risk in application of LAMS to future aircraft. The results of the study show that the YF-12A would be a suitable test bed for continuing development of LAMS technology. This was demonstrated by defining five candidate LAMS systems and analytically evaluating them with regard to performance and mechanization. Each of the five systems used a different combination of force producers. A small canard vane or a mass-reaction device mounted near the cockpit was considered as a possible LAMS force producer, together with the existing inboard and outboard elevons. It was concluded that a combination of canard vane and outboard elevons would provide the most effective system for the YF-12A. Author

N73-15034*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MOTION SIMULATOR STUDY OF LONGITUDINAL STABILITY REQUIREMENTS FOR LARGE DELTA WING TRANSPORT AIRPLANES DURING APPROACH AND LANDING WITH STABILITY AUGMENTATION SYSTEMS FAILED
C. T. Snyder, E. B. Fry, F. J. Drinkwater, III, R. D. Forrest (FAA), B. C. Scott (FAA), and T. D. Benefield (FAA) Dec. 1972 109 p refs
(NASA-TM-X-62200) Avail: NTIS HC $7.50 CSCL 01B

A ground-based simulator investigation was conducted in preparation for and correlation with an in-flight simulator program. The objective of these studies was to define minimum acceptable levels of static longitudinal stability for landing approach following stability augmentation systems failures. The airworthiness authorities are presently attempting to establish the requirements for civil transports with only the backup flight control system operating. Using a baseline configuration representative of a large delta wing transport, 20 different configurations, many representing negative static margins, were assessed by three research test pilots in 33 hours of piloted operation. Verification of the baseline model to be used in the TIFS experiment was provided by computed and piloted comparisons with a well-validated reference airplane simulation. Pilot comments and ratings are included, as well as preliminary tracking performance and workload data. Author

N73-15035# Ryan Aeronautical Co., San Diego, Calif.
THE AVSYN AIR VEHICLE SYNTHESIS PROGRAM FOR CONCEPTUAL DESIGN
K. L. Sanders and P. A. Staley 1972 32 p refs Presented at IPAD Colloq., Hampton, Va., 2-5 Oct. 1972
Avail: NTIS HC $3.75

A digital computer program for the rapid sizing, parametric analyses and optimization of general aircraft configurations and propulsion concepts, for a specified mission profile, performance, and payload, is described. The program, Air Vehicle Synthesis (AVSYN), was developed to serve as a key analytical tool for conceptual design efforts. Input consists of a total of 140 variables describing the geometric, aerodynamic, and weight characteristics (independent variables) of the baseline configuration, and the speeds, altitudes, and distances of the mission segments. A combat case may be represented by a steady state, sustained turn requirement. The program uses a generalized geometric model, empirical weight and drag relationships; permits computation of parameter trade-offs for selected sizing options and constraints; and finally converges on a solution for gross weight, vehicle and engine size for a balanced mission. Author

N73-15036# Lockheed Missiles and Space Co., Huntsville, Ala.
WAKE VORTEX AVOIDANCE SYSTEM Final Report, Apr. - Dec. 1972
D. J. Wilson, M. R. Brashears, E. A. Carter, and K. R. Shrider Dec. 1972 131 p refs
(Contract DOT-FA72WA-2878)
(LMSC/HREC-D306226; HREC-2878-2; FAA-RD-72-108) Avail: NTIS HC $8.75

A conceptual design for a predictive-detective system to: (1) predict the movement and decay of aircraft-generated vortices in air corridors near the air terminal using forecast meteorological conditions; (2) periodically update the prediction by monitoring vortex movements; (3) provide a forecast of separation requirements for optimum aircraft spacing according to prevailing vortex conditions, and (4) provide a waveoff (or hold) capability for rare cases when vortices stray unpredictably into a hazard zone. The predictive system computer model includes the meteorological input data and the fluid mechanics used to develop the vortex prediction. Fluid mechanic discussions include wind, wind shear and buoyancy effects upon vortex transport and decay. Computer runs are presented to demonstrate vortex transport under numerous meteorological conditions at example airports. A test for proof of the predictive system concept is discussed. Author

N73-15037*# Recovery Systems Research, Inc., Alamogordo, N. Mex.
DESIGN STRESS ANALYSIS AND PERFORMANCE CHARACTERISTICS FOR 140 FT. DIAMETER RSR RIBCO PARACHUTE SYSTEM Final Report, 2 Dec. 1971 - 1 Apr. 1972
Joe A. Haden 30 Jul. 1972 32 p refs
(Contract F19628-72-C-0131; NASA Order L-9698)
(NASA-CR-130304; AFCRL-72-0451) Avail: NTIS HC $3.75 CSCL 01B

The design, stress analysis and high altitude performance of the RSR RIBCO Parachute System are discussed. A 140-foot diameter parachute system was tested. This system was released from a balloon at 100,000 feet altitude with a payload of 611 pounds. Performance characteristics (opening time, opening shock, snatch force, rate of descent and total descent time) were very nearly as predicted. Test results indicate that the RIBCO System offers many advantages over conventional parachute systems. Author

N73-15038# National Aerospace Lab., Tokyo (Japan).
EFFECT OF GROUND PROXIMITY ON THE LONGITUDINAL AERODYNAMIC CHARACTERISTICS OF AN AIRPLANE WITH A JET-FLAPPED HIGH LIFT WING
Hiroshi Endo, Hiroshi Takahashi, Teruomi Nakaya, and Tadaharu Watanuki Aug. 1972 30 p refs In JAPANESE; ENGLISH summary
(NAL-TR-294) Avail: NTIS HC $3.50

The effect of ground proximity on the lift, drag, and pitching moment of an aircraft equipped with a jet-flapped rectangular wing was investigated in a low speed wind tunnel using a moving belt technique. It was found that ground effect is more pronounced in pitching moment and drag than in lift. The effect on the pitching moment is due to suppression by ground proximity of the downwash of the tail, which otherwise generates a positive pitching moment on the tail. Author

N73-15039# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
AN EXPERIMENTAL AND THEORETICAL INVESTIGATION OF PROPELLERS OPERATING IN TURBULENCE
T. A. P. S. AppaRao Nov. 1972 130 p refs
(UTIAS-183) Avail: NTIS HC $8.50

The effect of atmospheric turbulence on the forces and moments on a propeller have been studied both experimentally and theoretically. The experimental study consisted of measuring the normal force and pitching moment responses of a model propeller operating in a turbulent field generated in a wind. The theoretical part of the investigation includes the development of a method of calculating the response of the propeller in terms of the turbulence spectra and the aerodynamic derivatives. Results of the two methods of investigation are compared. Author

N73-15040*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A SUBJECTIVE EVALUATION OF SYNTHESIZED STOL AIRPLANE NOISES
Clemans A. Powell, Jr. Washington Jan. 1973 36 p refs
(NASA-TN-D-7102; L-8596) Avail: NTIS HC $3.00 CSCL 01B

A magnitude-estimation experiment was conducted to evaluate the subjective annoyance of the noise generated by possible future turbofan STOL aircraft as compared to that of several current CTOL aircraft. In addition, some of the units used to scale the magnitude of aircraft noise were evaluated with respect to their applicability to STOL noise. Twenty test subjects rated their annoyance to a total of 119 noises over a range of 75 PNdb to 105 PNdb. Their subjective ratings were compared with acoustical analysis of the noises in terms of 28 rating scale units. The synthesized STOL noises of this experiment were found to be slightly more annoying than the conventional CTOL noises at equal levels of PNL and EPNL. Over the range of levels investigated the scaling units, with a few exceptions, were capable of predicting the points of equal annoyance for all of the noises with plus or minus 3 dB. The inclusion of duration corrections, in general, improved the predictive capabilities of the various scaling units; however, tone corrections reduced their predictive capabilities. Author

N73-15041*# McDonnell Aircraft Co., St. Louis, Mo. Aircraft Advanced Engineering Group.
CONCEPTUAL DESIGN OF A V/STOL LIFT FAN COMMERCIAL SHORT HAUL TRANSPORT Summary Report
Washington NASA Jan. 1973 88 p refs
(Contract NAS2-5499)
(NASA-CR-2184) Avail: NTIS HC $3.00 CSCL 01C

Conceptual designs of V/STOL lift-fan commercial short-haul transport aircraft for the 1980-85 time period were studied to determine their technical and economic feasibility. Engine concepts studied included both integral remote fans. The scope of the study included definition of the hover control concept for each propulsion system, aircraft design, aircraft mass properties, cruise performance noise, and ride qualities evaluation. Economic evaluation was also studied on a basis of direct operating cost and route structure. Author

N73-15042*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HIGH ALTITUDE FLIGHT TEST OF A DISK GAP BAND PARACHUTE DEPLOYED BEHIND A BLUFF BODY AT A MACH NUMBER OF 2.69
Clinton Eckstrom and Darrell R. Branscome Washington Dec. 1972 71 p refs
(NASA-TM-X-2671; L-8555) Avail: NTIS HC $3.00 CSCL 01B

A flight test was conducted with a 55-foot diameter disk-gap-band parachute located at a trailing distance of 4.4 forebody diameters behind a 15-foot diameter bluff-body planetary entry aeroshell and attached instrumented payload. At the time of parachute deployment the aeroshell-payload combination was oscillating through an angle-of-attack range of plus or minus 40 deg. Continued oscillatory motion of the aeroshell-payload combination and similar motion of the parachute caused rapid changes in parachute shape and loading which resulted in extensive cloth damage in the band and outer disk-edge areas of the parachute canopy. During steady-state descent the damage parachute provided an effective-drag coefficient of about 0.33 which was about 60 percent of that expected. Author

N73-15043# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany). Inst. fuer Angewandte Gasdynamik.
FUNDAMENTALS OF THE FLOW FEATURES ASSOCIATED WITH THE ATTACHMENT AND DETACHMENT OF A PLANE JET FLOWING OVER AN AIRFOIL (COANDA-EFFECT) [GRUNDZUEGE DER STROEMUNGSVORGAENGE BEIM ANLEGEN UND ABREISSEN EINES FLACHSTRAHLS BEI DER UMSTROEMUNG EINES FLUEGELPROFILS (COANDA-EFFEKT)]
Hansgeorg Riedel 1971 50 p refs In GERMAN; ENGLISH summary
(DLR-FB-71-46) Avail: NTIS HC $4.50; DFVLR, Porz, West Ger. 15,30 DM

The flow features connected with the attachment and detachment of a plane jet flowing over a curved surface are dealt with the special case of the flow of a two-dimensional jet of air over an airfoil. The considerations were restricted to turbulent continuum flow, the jet and the surrounding medium consisting of the same fluid. Jet attachment and detachment criteria were developed on a heuristic basis. The jet attachment criterion was applied to plane jet flow over thin flat plate and circular cylinder. The results are compared with experimental data.
Author (ESRO)

N73-15044# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany). Inst. fuer Angewandte Gasdynamik.
CONTRIBUTION TO WAVE DRAG REDUCTION AT ZERO LIFT IN FRONT OF SYMMETRICAL POINTED WINGS OF FINITE THICKNESS AND OF THE SAME VOLUME AS GEOMETRICAL FUNCTIONS OF WING PLANFORM AND DISPLACEMENT OF THE MAXIMUM THICKNESS IN SPAN- AND CHORDWISE DIRECTION [BEITRAG ZUR VERRINGERUNG DES WELLENWIDERSTANDES BEI NULLAUFTRIEB VORN SPITZER SYMMETRISCHER FLUEGEL ENDLICHER DICKE UND GLEICHEN VOLUMENS ALS FUNKTIONEN DER GEOMETRIE VON GRUNDRISSFORM UND VERSCHIEBUNG DER MAXIMALEN DICKE IN SPANNWEITEN- UND TIEFENRICHTUNG]
Friedrich Keune Jul. 1971 46 p refs In GERMAN; ENGLISH summary
(DLR-FB-71-61) Avail: NTIS HC $4.50; DFVLR Porz, West Ger. 19,20 DM

The influence of a pronounced displacement of the maximum thickness in a spanwise direction on wave drag was investigated theoretically for a certain analytically defined distribution of finite thickness and planform. It is shown that a much larger displacement of the maximum thickness can be achieved than was considered. The change in drag is therefore markedly larger than was found previously. The most favourable cases lead to a wave drag divergence up to 2/3 of the original value. For wings with sharp leading edges this value increases or reaches a minimum.
Author (ESRO)

N73-15045# Aerospatiale Usines de Toulouse (France).
THE TECHNICAL DEVELOPMENT OF AIR TRANSPORT IN THE 70'S. EUROPEAN CONTRIBUTION [DIE TECHNISCHE ENTWICKLUNG DES LUFTTRANSPORTS IN DEN 70ER JAHREN. EUROPAEISCHER BEITRAG ZU DIESER ENTWICKLUNG]
Henri Ziegler 1972 54 p In GERMAN
Avail: NTIS HC $4.75

A survey is presented of the present state of development of air transportation. The trends during the next decades are analyzed. These include speed and capacity increase, V/STOL aircraft, and organization of third level traffic. The French program is presented along these lines. It includes the supersonic transport Concorde, the European Airbus development, the STOL Breguet 941 and the Corvette. Economics of third level traffic are discussed.
Author (ESRO)

N73-15046# Vereinigte Flugtechnische Werke-Fokker G.m.b.H., Bremen (West Germany).
VFW 624: MARKET, OPERATION, AND TECHNIQUES [VFW 624: MARKT, BETRIEB UND TECHNIK]
H.-J. Hoeppner 1972 46 p In GERMAN Presented at the 5th DGLR Ann. Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-54) Avail: NTIS HC $4.50

The role of conventional STOL aircraft in future passenger transportation in Europe is discussed. One of the main problems is noise reduction, and it is pointed out that the CSTOL is an improvement with its steep takeoff and landing characteristics. The CSTOL is also a means of increasing the traffic capacity of existing airports, so that saturation level will not be reached until 1990. The planned air traffic control organization at European level (Eurocontrol), will allow better use of air highway capacity. Advantages of CSTOL in comparison to high speed rail transportation are indicated. The technology of CSTOL is demonstrated using the VFW 614 characteristics, which are similar.
Author (ESRO)

N73-15047# Bodenseewerk Geraetetechnik G.m.b.H., Ueberlingen (West Germany).
INTEGRATION PROBLEMS OF AIRCRAFT INSTRUMENTS AND CONTROL SYSTEM FOR NEW APPROACH METHODS [PROBLEME DER INTEGRATION VON FLUGGERAET UND FLUGFUEHRUNGSSYSTEM BEI NEUEN ANFLUGVERFAHREN]
G. Schaenzer 1972 31 p refs In GERMAN Presented at the 5th DGLR Ann. Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-096) Avail: NTIS HC $3.75

A newly developed STOL integrated flight control system is described, in which the angle of incidence and flight path position as well as all important variables of state are strongly coupled to elevator, thrust, and lift flaps. This system enables accurate control of the aerodynamic flow condition as well as the exact path guidance for nonlinear approach profiles. The results of simulation and flight tests with a DO-28 aircraft, for more than 500 automatic STOL landings for testing new approach methods, are discussed with regard to four separate problems: aircraft instrumentation, beam guidance system, flight control system, and displays.
Author (ESRO)

N73-15048# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
EFFICIENCY INCREASE BY CONTROL SYSTEM SUPPORTED AIRCRAFT DESIGN [LEISTUNGSERHOEHUNG DURCH REGLERGESTUETZTEN FLUGZEUGENTWURF]
Gerhard Loebert Sep. 1972 28 p refs In GERMAN Presented at the 5th DGLR Ann. Meeting, Berlin, 4-6 Oct. 1972
(MBB-UFE-895-72-O; DGLR-Paper-72-094) Avail: NTIS HC $3.50

The advantages of the control configured vehicle concept compared to conventional aircraft design, are pointed out for several examples. The improvements are found especially in the specific performance surplus at high lift coefficients, and in an increase of the obtainable maximal lift coefficients. The dynamic flight characteristics of these aircraft can be made similar to or better than aerodynamically stable aircraft by a suitable artificial stabilization.
Author (ESRO)

N73-15049# Eidgenossisches Flugzeugwerk, Emmen (Switzerland). Versuchs- und Forschungsabteilung.
CONTRIBUTION TO THE PROBLEM OF INGESTION OF FOREIGN BODIES INTO ENGINE INTAKES [BEITRAG ZUM PROBLEM DES EINSAUGENS VON FREMDKOERPERN IN TRIEBWERKSEINLAEUFE]
Hans Pflugshaupt Sep. 1972 55 p refs In GERMAN Presented at the 5th DGLR Ann. Meeting, Berlin, 4-6 Oct. 1972
(FO-1149; DGLR-Paper-72-107) Avail: NTIS HC $4.75

The design of an aerodynamic screen for the short-range Mercury aircraft engine intake is presented. The danger of ingestion of foreign bodies into the engine intake nozzle because of vortex formation is one of the inconveniences of engine under wing arrangement on low wing aircraft. Blow away jets generated by the engine compressor and directed towards the center of the vortex on the ground are used to eliminate this danger.
Author (ESRO)

N73-15050# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung fuer Theoretische Aerodynamik.
THEORETICAL PARAMETER STUDIES OF WING-FUSELAGE COMBINATIONS [THEORETISCHE PARAMETERUNTERSUCHUNGEN AN FLUEGEL-RUMPF-KOMBINATIONEN]
Horst Koerner Aug. 1972 42 p refs In GERMAN; ENGLISH summary
(DLR-FB-72-63) Avail: NTIS HC $4.25; DFVLR. Porz, West Ger. 11 DM

A parameter study is presented of the influence of the main geometry parameters on the aerodynamic characteristics of a wing-fuselage combination in incompressible flow. A prediction method for wing-fuselage combinations with cylindrical fuselage developed by the Author is used. The parameters investigated in this study are body diameter, wing position, sweep, planform taper, and aspect ratio. Results are given for the lift slope, the aerodynamic centre of the total arrangement, and in some cases the local values along the span.
Author (ESRO)

N73-15051# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
EVALUATION OF LATERAL-DIRECTIONAL HANDLING QUALITIES AND ROLL-SIDESLIP COUPLING OF FIGHTER CLASS AIRPLANES, VOLUME 2 Final Report
Edward M. Boothe and Michael L. Parrag Wright-Patterson AFB, Ohio AFFDL May 1972 225 p
(Contract F33615-71-C-1240; AF Proj. 9219)
(AD-748436; CAL-BM-3053-F-2-Vol-2; AFFDL-TR-72-36-Vol-2) Avail: NTIS CSCL 01/3

Maneuvering tasks representative of the fighter mission and a precision bank angle tracking task were performed for evaluations. Evaluations were conducted at three Dutch roll frequencies, three roll-to-sideslip ratios and at values of Dutch roll damping on either side of the MIL-F-8785B(ASG) boundary. Satisfactory flying qualities were not obtained for any of the low Dutch roll frequency configurations investigated in this experiment. The Dutch roll damping requirements were found to be adequate, especially when the additional increment of damping as a function of Dutch roll frequency and roll-to-sideslip ratio is added. The roll-sideslip coupling requirements in terms of sideslip excursions were found to be conservative, especially at low to moderate values of roll-to-sideslip ratio. Author (GRA)

N73-15052# National Aeronautical Establishment, Ottawa (Ontario).
A SUGGESTED METHOD FOR ESTIMATING PATCH LENGTH FROM TURBULENCE MEASUREMENTS USING RESULTS FROM LOW ALTITUDE FLIGHTS BY A T-33 AIRCRAFT
D. G. Gould and J. I. MacPherson Aug. 1972 26 p refs
(AD-750607; NAE-LR-562; NRC-12793) Avail: NTIS CSCL 01/1

When an aircraft encounters a patch of turbulence, the RMS turbulence intensity is usually constant only over a portion of the total period of exposure. A method is suggested for estimating the patch length as a function of intensity for turbulence encounters that have two or more regions of different turbulence intensities. It makes use of the fact that the amplitude or level crossing distributions that fall between the normal distribution and the exponential distribution be closely approximated by a superposition of normal distributions of different intensities. Level crossing distributions of vertical acceleration from a series of T-33 low altitude turbulence research flights are analyzed using this procedure, and results from flatland and hilly lakeland are compared. Author (GRA)

N73-15053# Army Air Mobility Research and Development Lab., Moffett Field, Calif.
A THEORETICAL AND EXPERIMENTAL INVESTIGATION OF FLAP-LAG STABILITY OF HINGELESS HELICOPTER ROTOR BLADES
Robert A. Ormiston and William C. Bousman 1972 15 p refs
(AD-750359) Avail: NTIS CSCL 01/3

A substantial insight into the fundamental stability characteristics of the hingeless rotor may be obtained by considering only the flap and lead-lag degrees of freedom of a single blade. Although portions of this problem have been examined in previous research, the effects of many basic rotor parameters are poorly understood. The present study was undertaken to provide a rigorous formulation of the problem, and to systematically investigate the important parameters which characterize actual hingeless rotor blade configurations. In the absence of available experimental data a model rotor was designed and tested to validate the theoretical analysis. Author (GRA)

N73-15054# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Div.
INVESTIGATION OF AN IMPROVED RESCUE HOIST SYSTEM FOR H-3 HELICOPTERS Final Report
Howard B. Jopson 28 Sep. 1972 18 p ref
(AD-750289; NADC-72173-VT) Avail: NTIS CSCL 01/3

The report discusses the uses and shortcomings of the at-sea lift and rescue hoist system of the H-3 helicopter and desired capabilities for the future. Recommendations for providing an improved helicopter hoist system are presented. Author (GRA)

N73-15055# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
BALANCING HIGH SPEED LIGHT ROTORS RESTING ON BEARINGS WITH GAS LUBRICATION
A. N. Bragin and E. A. Panfilov 17 Aug. 1972 17 p refs Transl. into ENGLISH from the publ. "Teoriya i Praktika Uravnoveshivaniya Mashin i Priborov" Moscow, Izd-vo Mashinostroyeniye, 1970 p 210-216
(AF Proj. 7343)
(AD-750951; FTD-MT-24-290-72) Avail: NTIS CSCL 01/3

Under the influence of disbalance due to compression of the gassy layer in the bearing, the center of gravity of the rotor describes a circle, the radius of which exceeds its eccentricity in proportion to the angular velocity of rotation. The geometrical center of the journal also describes a circle of constantly greater radius, increasing the compression of the gas layers. At a certain increase of the inflexibility of the gas layer, so called inversion takes place: a transition accompanied by a sharp increase in the oscillation amplitude of the journal, after which the rotor begins to rotate about the center of gravity with smaller oscillations, which are close to the value of residual eccentricity. Author (GRA)

N73-15056# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
REDUCTION OF BASE DRAG DURING SUPERSONIC VELOCITIES USING POWER METHOD
B. I. Buryshev 7 Sep. 1972 9 p Transl. into ENGLISH from Teplo-1 Massoperenos (USSR), no. 12, 1969 p 35-38
(AD-750950; FDT-HC-23-0836-72) Avail: NTIS CSCL 01/3

The article describes the results of experimental drag investigation of a nacelle containing two engines and a wing of a long range supersonic plane for reduction of base during supersonic velocities using power method. GRA

N73-15057# Frankford Arsenal, Philadelphia, Pa.
DYNAMIC RESPONSE INDEX MINIMIZATION FOR PERSONNEL ESCAPE SYSTEMS
Leonard A. DeStefano 1972 15 p refs
(AD-750318) Avail: NTIS CSCL 01/3

The paper outlined a technique which may be employed with minimum modification to existing rocket catapult components to reduce the probability of injury to users of aircraft emergency escape systems. Experimental tests have verified the results of theoretical analyses and have demonstrated the ability to modify the catapult ballistics and thus moderate the dynamic response index (DRI). In addition, this technique may also be employed to upgrade the performance of existing and future aircraft escape systems by permitting maximization of the ejection velocity with respect to the allowable catapult stroke and DRI specification limit. Author (GRA)

N73-15058# Army Electronics Command, Fort Monmouth, N.J.
INFRARED TECHNOLOGY AND ITS APPLICATION FOR MEASUREMENT OF AIRCRAFT
Leonard H. Holden, Jr. and Edward Valenzuela Mar. 1972 202 p refs
(DA Proj. 1F1-62208-A-148)
(AD-749798; ECOM-5386) Avail: NTIS CSCL 01/3

The report confined to the measurement of infrared radiation emitted by aircraft, includes a catalog of each type of aircraft in the US Army inventory. Each type is represented because the measurement procedures used may differ for each depending upon size, speed, and intended tactical use. A brief discussion of the physical laws involved in taking such measurements is also included, as is a discussion on the different backgrounds encountered in a measurement program. The need for adequate instrument calibration is emphasized. Various measurement techniques and their application are discussed. Data reduction and analysis are covered briefly, and several parameters that are routinely determined by analysis are considered. Author (GRA)

N73-15059# Naval Aerospace Medical Research Lab., Pensacola, Fla.
ORIENTATION-ERROR ACCIDENTS IN REGULAR ARMY UH-1 AIRCRAFT DURING FISCAL YEAR 1969: RELATIVE INCIDENCE AND COST

W. Carroll Hixson, Jorma I. Niven, and Emil Spezia Aug. 1972 35 p refs
(AD-749695; NAMRL-1163; USAARL-73-1) Avail: NTIS CSCL 01/2

The report deals with the magnitude of the pilot disorientation/vertigo accident problem in Regular Army UH-1 helicopter operations. Incidence and cost data presented for fiscal year 1969 include a total of 46 major and minor orientation-error accidents (16 of which were fatal), resulting in 39 fatalities, 67 nonfatal injuries, and $8,130,297 aircraft damage.
Author (GRA)

N73-15060# Naval Ordnance Lab., White Oak, Md.
A TECHNIQUE FOR THE CALCULATION OF THE OPENING SHOCK FORCES FOR SEVERAL TYPES OF SOLID CLOTH PARACHUTES
William P. Ludtke 20 Jun. 1972 67 p refs
(AD-749690; NOLTR-72-146) Avail: NTIS CSCL 01/3

In 1965, the Naval Ordnance Laboratory was engaged in a project which required the deployment of a 35-foot-diameter extended-skirt parachute (type T-10) as the second stage of a retardation system at an altitude of 100,000 feet. At that time, there were no available data on the T-10 parachute deployed under similar circumstances. This new parachute opening-shock calculation technique was generated as a solution to this dilemma. A drag area ratio-time ratio signature derived from infinite mass wind-tunnel parachute deployments is combined with Newton's second law of motion to develop instantaneous velocity ratios and shock factors during the deployment process. Methods of computing the reference time (to) and the inflation time (tf) are presented.
Author (GRA)

N73-15061# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SELF-ADJUSTING AUTOMATIC CONTROL SYSTEMS OF AEROELASTIC AIRCRAFT
F. I. Fedorenko, V. A. Vishnevetskaya, V. I. Glukhov, and L. R. Lvov 17 Aug. 1972 17 p refs Transl. into ENGLISH from Inform. Mater. (Moscow), no. 7, 1970 p 36-42
(AF Proj. 487T)
(AD-750501; FTD-MT-24-353-72) Avail: NTIS CSCL 01/3

High quality control of an aircraft as a rigid body can be achieved (with allowance for the nonlinearity and inertia of the actuator) by using appropriate compensating devices and by placing adaptive filters in the angular velocity sensor circuits to eliminate noise caused by high and low frequency elastic oscillations. The primary low frequency components flexural vibrations in the wings and fuselage can be damped by special control surfaces on the wings and fuselage. This damping should not be altered from accelerometer sensors positioned in selected points. Required phase relationships are obtained with compensating necessary and either phase lead or phase lag filters. Automatic control of optimal gain in the stabilization loops is accomplished with the aid of spectrum analyzers. The synthesis of controller structure and parameters should be based on graph theory methods.
Author (GRA)

N73-15062# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROSPECTIVE AUTOMATIC FLIGHT CONTROL SYSTEMS
A. D. Aleksandrov 18 Aug. 1972 21 p refs Transl. into ENGLISH from Inform. Mater. (Moscow), no. 7, 1970 p 20-29
(AF Proj. 487T)
(AD-750502; FTD-MT-24-354-72) Avail: NTIS CSCL 01/3

The report contains a description of nonlinear self adjusting and variable structure automatic control systems for piloted and pilotless flight vehicles. Control problems considered include load stabilization, limitation of critical regimes, and control of variable pitch and roll angles. Emphasis is placed on the extension of stability ranges by appropriate switching of the controller structure. The additional use of adaptive loops is demonstrated and oscillations arising from intrinsic nonlinear characteristics of electric servo systems (dead zones and time lags) are examined.
Author (GRA)

N73-15063# Air Force Academy, Colo. Dept. of Aeronautics.
THE EFFECTS OF EXTERNAL STORES ON THE LONGITUDINAL STATIC STABILITY OF AIRCRAFT Progress Report, 1 Sep. 1971 - 15 Jun. 1972
Edgar W. Lorson Jun. 1972 57 p refs
(AD-750120; DFAN-TR-72-2) Avail: NTIS CSCL 01/3

Studies were made of experimental data to determine the effects of various external store characteristics, spanwise positions, and Mach number on the static longitudinal stability of various aircraft. Data used included results of wind tunnel tests run at the USAF Academy as well as tests run at the Arnold Engineering Development Center, the Naval Ship Research and Development Center and Breguet Aviation. External store characteristics considered were store frontal area, volume, and side projected area. The correlation between any of the three characteristics and change in static margin was approximately the same. Loss in static margin tended to increase to a maximum at moderate values of frontal area, volume, or side projected area and then to decrease for higher values.
Author (GRA)

N73-15064# Honeywell, Inc., Minneapolis, Minn. Systems and Research Div.
AN INVESTIGATION OF AIRBORNE DISPLAYS AND CONTROLS FOR SEARCH AND RESCUE (SAR). VOLUME 4: AVIONICS REQUIREMENTS FOR A UTILITY AIRCRAFT Final Report, Sep. 1971 - Jan. 1972
O. H. Lindquist, B. A. Olson, R. J. Kirk, and J. W. Wingert Sep. 1972 79 p Sponsored in part by Naval Air Systems Command, ECOM, Coast Guard Headquarters, and AFFDL
(Contract N00014-69-C-0460; NR Proj. 213-072)
(AD-750463; Honeywell-12609-FRI-Vol-4; JANAIR-720901) Avail: NTIS CSCL 06/7

An analytical study was conducted to define an avionics system concept for a U.S. Coast Guard multimission fixed-wing twin-engine aircraft. The system requirements were compiled from a previous concept definition study done under this contract for a search and rescue helicopter and from analysis of mission scenarios fitted to the unique USCG missions. The study tasks included development of representative mission scenarios, avionics and sensor package selection, man/machine function allocation, workload analysis and simulation, aircraft ride qualities and crew visibility analyses, and definition of a recommended cockpit configuration and sensor installation.
Author (GRA)

N73-15065# Army Air Mobility Research and Development Lab., Fort Eustis, Va.
DYNAMIC COMPATIBILITY OF HELICOPTER PROPULSION SYSTEMS
John M. Vance and James Gomez, Jr. 1972 16 p refs
(AD-750387) Avail: NTIS CSCL 01/3

The overall problem of achieving dynamic compatibility in helicopter propulsion systems can be conveniently divided into four major areas: engine vibration limits; design of the engine/airframe interface; whirling and vibration of power transmission shafting, gearboxes, and bearings; and torsional stability of the engine and drive train with closed-loop fuel controls. These four areas are discussed each with a review of the state of the art and recommendations for future research and development.
Author (GRA)

N73-15066# Army Air Mobility Research and Development Lab., Moffett Field, Calif.
NEAR OPTIMAL TAKEOFF PERFORMANCE OF A HEAVILY LOADED HELICOPTER IN GROUND EFFECT
C. Rande Vause and Fredric H. Schmitz 1972 16 p refs
(AD-750388) Avail: NTIS CSCL 01/2

The purpose of the investigation was to quantitatively define, through mathematical modeling, those parameters which are important to the pilot who must perform a heavily loaded STOL takeoff. The mathematical model can be used to quantitatively predict takeoff performance of single rotor Army helicopters. The resulting equations are physically easy to interpret and offer new insight into the delicate power balance of the takeoff maneuver.
Author (GRA)

N73-15067# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
AN EXAMINATION OF THE CURRENT UNITED STATES AIR FORCE AIRCRAFT ENGINE STATUS REPORTING SYSTEM M.S. Thesis
James F. Brady and Michael J. Scritchfield Sep. 1972 91 p

refs
(AD-750910; SLSR-9-72) Avail: NTIS CSCL 21/5

By 1972, the United States Air Force has had an aircraft engine status reporting system for over twenty-two years. Since new advances in engine design could possibly overburden the system, a cross examination was made. The decision making environment of the Engine Item Manager was evaluated, along with the current reporting system. In addition, maintenance, supply, and transportation information systems were examined to see what parallel engine data they presented. As a result of this research, a new system was proposed that would eliminate the Engine Status Reporting System at a substantial saving to the Air Force. Author (GRA)

N73-15068# Army Natick Labs., Mass.
A DISCUSSION OF THE APPLICABILITY OF PARACHUTES WITH PULLED DOWN VENTS FOR AIRDROP OF SUPPLIES AND EQUIPMENT FROM A 500 FOOT ALTITUDE Final Report
Edward J. Giebutowski Oct. 1971 25 p ref
(DA Proj. 1F1-62203-D-195)
(AD-750585; USA-NLABS-TR-72-23-AD) Avail: NTIS CSCL 01/3

Data from thirty-one airdrop tests were plotted to show the variation of vertical, horizontal and total velocities and system orientation angle from the vertical as a function of altitude loss from the launch altitude. The purpose was to determine the applicability of using standard G-11A parachutes modified with pulled down vents for airdrop of Army supplies and equipment from an altitude of 500 feet. It was concluded that the system second vertical was the earliest event which could be considered a suitable criterion for acceptable impact conditions of horizontal and vertical velocity and system orientation angle.
Author (GRA)

N73-15069# Ohio State Univ. Research Foundation, Columbus.
AIR-CUSHION PRESSURE DURING STIFF-OPERATION FOR AIR-CUSHION LANDING SYSTEMS. PART 2: EXPERIMENTS Technical Report, Jul. 1971 - Jan. 1972
Lit S. Han Mar. 1972 105 p
(Contracts F33615-70-C-1019; F33615-69-C1001; AF Proj. 1369)
(AD-750936; AFFDL-TR-71-4-Pt-2) Avail: NTIS CSCL 01/2

The report describes the experimental verification of the theory developed in Part I for ACLS in its stiff-mode operation. It also reports the discharge coefficient data required for computing air flow requirements. At low ground clearances, the theory was verified to be in excellent agreement with the experimental data obtained. At higher values of the ground clearance where the viscous flow theory is not expected to hold, appreciable difference between the experimental data and theoretical computation was observed. A multi-jet theory yet to be developed is expected to bridge the gap. Author (GRA)

N73-15070# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
RESEARCH AND DEVELOPMENT CONTRIBUTIONS TO AVIATION PROGRESS (RADCAP). VOLUME 1: SUMMARY REPORT Final Report
John G. Paulisick Aug. 1972 129 p refs
(AD-750108; ASD-TR-72-3073-Vol-1) Avail: NTIS CSCL 01/2

A two volume report contains the results of a joint DoD-NASA-DoT study of U.S. aeronautical progress since 1925. Volume 1 reviews the positive contributions of military aeronautical research and development programs to civil aviation, and assesses some possible future contributions of those military programs. The summary of detailed results is concerned with a review of the progress that has been made in aviation since 1925, an examination of current and planned military aeronautical programs with an assessment of their relevancy to civil aviation, relationships to the needs of civil airliner technology, and important findings and observations in the RADCAP Study. GRA

N73-15071# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
RESEARCH AND DEVELOPMENT CONTRIBUTIONS TO AVIATION PROGRESS (RADCAP). VOLUME 2: APPENDICES 1 THRU 9 Final Report
Charles R. Hudson, Jr., James B. Gebhard, Robert E. Dean, Richard J. Framme, and Albert Olevitch Aug. 1972 613 p refs
(AD-750109; ASD-TR-72-3073-Vol-2) Avail: NTIS CSCL 01/2

Volume 2 of a two volume report provides supplementary information concerning the results discussed in Volume 1. It covers the several technical disciplines in order to identify the major technological advances that have been made in aviation since 1925, the relevancy of currently planned and funded DoD aeronautical R-D programs to the R-D needs of civil transport aviation. Author (GRA)

N73-15072# Princeton Univ., N.J.
THE PRINCETON PENNSYLVANIA ARMY AVIONICS RESEARCH PROGRAM. TAKE OFF OF HEAVILY LOADED HELICOPTERS Final Task Report, 1 Sep. 1966 - 30 Dec. 1971
G. J. Born, E. J. Durbin, and F. H. Schmitz Jan. 1972 93 p refs
(Contract DA-28-043-AMC-02412(E); DA Proj. 1H1-62202-A-219)
(AD-750615; ECOM-02412-7) Avail: NTIS CSCL 01/2

In the report are given the results of the optimal control theory applied to the take-off of heavily loaded helicopters and the instrumentation requirements to enhance VTOL-STOL pilot flight control during the take-off maneuvers. The analysis and computation determined constrained and unconstrained extremal trajectories which maximize final altitude at a given distance (Research and Development Technical Report, ECOM 02412-4, August, 1969). The constrained optimal leads to a slightly decreased performance, but this is more than offset by the ease of implementation. The proposed take-off technique was simulated on an analog computer. A parameter sensitivity study was made which resulted in the formulation of specific instrumentation requirements. Author (GRA)

N73-15073# Princeton Univ., N.J.
THE PRINCETON PENNSYLVANIA ARMY AVIONICS RESEARCH PROGRAM. ELEMENTS OF HELICOPTER HOVERING AND NEAR HOVER OPERATIONS WITH A SLING LOAD Final Report, 1 Sep. 1966 - 30 Dec. 1971
Theodor A. Dukes Sep. 1972 72 p refs
(Contract DA-28-043-AMC-02412(E); DA Proj. 1H1-62202-A-219)
(AD-750618; ECOM-02412-12) Avail: NTIS CSCL 01/2

Three aspects of hovering and near-hover maneuvering of helicopters with sling loads are investigated. An elementary helicopter-load model is developed for the case of large attitude rate damping and is used to identify the most significant parameters and their effects on the dynamics. Various feedback loop closures are explored for their usefulness to provide damping to the pendulous helicopter-load motion. Three simple maneuvers are analyzed: arresting a swinging load motion, acceleration-deceleration and changing the hover location. Ideal thrust angle inputs are determined with which these elementary tasks can be performed so that there is no relative helicopter-load swinging motion at the end of the maneuver. A new Hover Mode of the earlier developed Integrated Trajectory Error Display (ITED) is described. Author (GRA)

N73-15074# Rochester Applied Science Associates, Inc., N.Y.
INVESTIGATION OF THE DISSIPATION OF THE TIP VORTEX OF A ROTOR BLADE BY MASS INJECTION Final Report
Richard P. White, Jr. and John C. Balcerak Aug. 1972 97 p refs
(Contract DAAJ02-71-C-0036; DA Proj. 1F1-62203-A-143)
(AD-750634; RASA-72-03; USAAMDRL-TR-72-43) Avail: NTIS CSCL 01/3

The report describes an experimental research program in which the outer section of a UH-1D helicopter blade was modified to incorporate a system for injecting the tip vortex produced by the blade with a mass of linearly directed air. The effects of nozzle geometry, the velocity of injection, the turbulence wavelength, and the angle of injection on the resulting strength of the trailed tip vortex were investigated, and the results are

presented in terms of quantitative measurements of the circulation strength as a function of the injected mass of air. Author (GRA)

N73-15075# Boeing Co., Philadelphia, Pa. Vertol Div.
SECTIONALIZED MAIN ROTOR BLADE ADVANCED DESIGN STUDY Final Technical Report
Tadeusz Tarczynski Aug. 1972 124 p refs
(Contract DAAJ02-70-C-0072; DA Proj. 1F1-62203-A-119)
(AD-750633; D210-10293-1; USAAMRDL-TR-72-8) Avail: NTIS CSCL 01/3

The report covers a study undertaken for the advanced design of a sectionalized main rotor blade. After investigation of the whole spectrum of design arrangements, a bolted-together design (with field replaceable boxes, L.E. tip and trailing edge) was chosen. For direct replacement of existing blades, a bolted design was selected with essentially the same dynamic rotor characteristics of the current production blade. The parameters that were closely matched to achieve this were: natural frequency, loads, and dynamic balance axis. A cost increase of approximately 50 percent is indicated over present UH-1H rotor blades to match current design features, utilizing ground rules on inherent and external damage specified by the procuring agency.
Author (GRA)

N73-15076# National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.
AIRCRAFT ACCIDENT REPORT: TANDY CORPORATION GATES LEARJET MODEL 25, N658TC, NEAR THE VICTORIA COUNTY, FOSTER AIRPORT, VICTORIA, TEXAS 18 JANUARY 1972
Aug. 1972 16 p
(PB-212484; NTSB-AAR-72-24) Avail: NTIS HC $3.00 CSCL 01B

A Gates Lear Jet Model 25, crashed at approximately 0745 central standard time, on January 18, 1972, during a nonprecision instrument approach to the Victoria County-Foster Airport, Victoria, Texas. The two crewmembers and seven passengers received fatal injuries. The airplane was destroyed. The airplane was enroute from Fort Worth, Texas, on an IFR clearance to Victoria, Texas. Witnesses in the area of the crash reported heavy fog and visibility restricted to approximately 100 feet. One nautical mile visibility is required for this airplane to be authorized for a landing at the Victoria County-Foster Airport. The probable cause of this accident was the lack of altitude awareness on the part of the flightcrew while descending into known weather conditions which were conducive to a rapid deterioration in forward visibility. Author (GRA)

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines, hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; Nuclear Engineering; and 28 Propulsion Systems.

N73-15077# Research Inst. of National Defence, Stockholm (Sweden).
INTERNAL IMPEDANCE OF STARTING BATTERIES
Rolf Andersson Apr. 1971 81 p refs In SWEDISH
(FOA-3-C-3667-94) Avail: NTIS HC $6.25

Starting batteries of the lead accumulator type have an internal impedance which varies with, among other things, the load conditions, working temperature and measurement frequency. The impedance lies between 3 and 30 mohm with frequencies between 20 and 5000 Hz. Older batteries, and batteries which have been unused for a long time, as well as exhausted batteries, may have an impedance which is 10 to 100 times greater. Author

N73-15078*# Heliotek, Sylmar, Calif.
DEVELOPMENT AND PILOT LINE PRODUCTION OF LITHIUM DOPED SILICON SOLAR CELLS Final Report
P. A. Payne 27 Oct. 1972 82 p refs Prepared for JPL
(Contract NAS7-100; JPL-953171)
(NASA-CR-130289) Avail: NTIS HC $6.25 CSCL 10A

The work performed over the period of September 1971 to August 1972 to develop production processes for fabrication of lithium doped P/N cells is described. The BCl3 diffusion without 02 was selected as the optimum diffusion process for fabrication of lithium doped cells. An 8-2-7 (warm up - deposition - drive-in time in minutes) diffusion schedule at 1055 C was used for the first two lots (300 cells each) delivered to JPL. Cell efficiencies ranged from 11.0 to 13.7% based on an AMO of 135.3 mW/sq cm. These high efficiencies were obtained using from 10 to 40 cells per boron diffusion; increasing the quantity beyond 40 resulted in lower outputs. At this point, the emphasis was placed on investigation of a BCl3 with 02 diffusion. Through evaluation of the effects of diffusion time and temperature, gas flow rates, and desposition plus drive-in vs. continuous deposition and no drive-in cycles, diffusion parameters were determined which produced short circuit currents of 136 + or - 4 mA for ten cells spaced along 12 in. of the diffusion boat. The quantity was increased to 60, 100, and 150 cell diffusions with no more variation in cell short circuit current than observed with 10 cells. Author

N73-15079*# General Electric Co., Philadelphia, Pa. Space Div.
FEASIBILITY STUDY OF A 110 WATT PER KILOGRAM LIGHTWEIGHT SOLAR ARRAY SYSTEM Quarterly Report, 1 Aug. - 31 Oct. 1972
N. F. Shepard, C. Stahle, A. Schneider, and K. L. Hanson 15 Nov. 1972 110 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953387)
(NASA-CR-130287; QR-2; Doc-72SD4249) Avail: NTIS HC $7.50 CSCL 10A

An investigation of the feasibility of a solar array panel subsystem which will produce 10,000 watts of electrical output at 1 A.U. with an overall beginning-of-life power-to-weight ratio of at least 110 watt/kg is reported. A description of the current baseline configuration which meets these requirements is presented. A parametric analysis of the single boom, two blanket planar solar array system was performed to arrive at the optimum system aspect ratio. A novel concept for the stiffening of a lightweight solar array by canting the solar cell blankets at a small angle to take advantage of the inherent in-plane stiffness to increase the symmetric out-of-plane frequency is introduced along with a preliminary analysis of the stiffening effect. A comparison of welded and soldered solar cell interconnections leads to the conclusion that welding is required on this ultralightweight solar array. The use of a boron/aluminum composite material in a BI-STEM type deployable boom is investigated as a possible advancement in the state-of-the-art.
Author

N73-15080*# Resalab Scientific Corp., Sunnyvale, Calif.
TECHNICAL, ANALYTICAL AND COMPUTER SUPPORT Final Report, 18 Feb. 1970 - 30 Sep. 1972
30 Sep. 1972 167 p refs Sponsored by NASA Prepared for JPL
(Contract JPL-952808)
(NASA-CR-130296)
Avail: NTIS HC $10.50 CSCL 10B

The development of a rigorous mathematical model for the design and performance analysis of cylindrical silicon-germanium thermoelectric generators is reported that consists of two parts, a steady-state (static) and a transient (dynamic) part. The material study task involves the definition and implementation of a material study that aims to experimentally characterize the long term behavior of the thermoelectric properties of silicon-germanium alloys as a function of temperature. Analytical and experimental efforts are aimed at the determination of the sublimation characteristics of silicon germanium alloys and the study of sublimation effects on RTG performance. Studies are also performed on a variety of specific topics on thermoelectric energy conversion. Author

N73-15081*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ISOTOPE BRAYTON SPACE POWER SYSTEMS AND THEIR TECHNOLOGY
Herman Schwartz 1972 30 p refs Presented at 1972 Intern. Meeting of the Am. Nucl. Soc., Washington, D.C., 12-17 Nov. 1972
(NASA-TM-X-68145; E-7263) Avail: NTIS HC $3.50

CSCL 10A
The objectives of the NASA Brayton Space Power Program and the advantages of achieving an isotope Brayton space power system are enumerated. The paper describes the 2-15 kWe Brayton engine, its subsystems, and major components and summarizes the status of the test program. Two areas of Brayton constituent technology are discussed - gas bearings and heat exchangers. A summary is given of a 500-2500 W isotope Brayton space power system study that showed very attractive performance, simplicity, and low cost for a system in this power range. Author

N73-15082*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A SERIES-RESONANT SILICON-CONTROLLED-RECTIFIER POWER PROCESSOR FOR ION THRUSTERS
Howard A. Shumaker, John Biess, and Daniel Goldin Washington Jan. 1973 21 p refs
(NASA-TM-X-2699; E-7143) Avail: NTIS HC $3.00 CSCL 10B

A program to develop a power processing system for ion thrusters is presented. Basic operation of the silicon controlled rectifier series inverter circuitry is examined. The approach for synthesizing such circuits into a system which limits the electrical stress levels on the power source, semiconductor switching elements, and the ion thruster load is described. Experimental results are presented for a 2.5-kW breadboard system designed to operate a 20-cm ion thruster. Author

N73-15083# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
DEVELOPMENT OF THE RADIO-ISOTOPE POWER GENERATOR TRISTAN
P. Zahn 1971 16 p Presented at Intern. Conf. on Chem. Sci., Paris, 20 Apr. 1971
(Conf-710444-11) Avail: AEC Depository Libraries

Tristan is a program for the development of a radioisotope thermoelectric power generator sponsored by the German Government. The energy storage is provided by radioactive materials (Sr -90, in particular, is the most suitable heat source material). The thermoelectric power generator used is described and the physical properties of this type of generator are exposed. The performances obtained in a preliminary active test unit are given; applications of such power sources are presented. NSA

N73-15084# AEG-Telefunken, Hamburg (West Germany).
THE HELIOS SOLAR CELL GENERATOR [DER HELIOS-SOLARZELLEN-GENERATOR]
H. Duerre and B. Goergens 1972 24 p In GERMAN Presented at the 5th DGLR Ann. Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-091) Avail: NTIS HC $3.25

Design and performance of the solar array for the Helios solar probe are discussed. Each of the 32 solar cell panels contains 49% solar cells and 51% second surface mirrors. The temperature qualification range is from -95 C to +200 C. The power requirements range from 240 to 315 W for the complete generator. One of the optimization problems was the soldered contacts of the solar cells, for which a special solution was found. Each solar cell is protected from irradiation by 150 micron thick quartz glass. A series resistance of 0.165 ohms was obtained per cell by dimensional optimization. The design and construction of the solar generator is described. Tests have shown the space applicability of this design. Author (ESRO)

N73-15085# Massachusetts Univ., Amherst. School of Engineering.
A HIGH ENERGY DENSITY STORAGE SYSTEM WITH ENCAPSULATED SILVER-ZINC CELLS FOR DEEP OCEAN APPLICATIONS
William A. Birtcher and William E. Heronemus Aug. 1972 71 p refs
(Contract N00014-68-A-0146)
(AD-750719; UM-72-10) Avail: NTIS CSCL 10/3

The investigation was concerned with the design of a high energy density storage system for deep ocean applications. A sampling of available storage cells is presented and their properties compared with those of the silver-zinc cell. The concept of packaging large numbers of silver-zinc batteries in small glass spheres is then developed, and systems capable of positive, neutral, or negative buoyancy are shown. These individual battery packages were integrated into complete electrical systems and the manner in which they are to be carried by a deep submergence vessel (DSV) is shown. Finally, the advantages of the pressure-proof silver-zinc system are demonstrated by means of a comparison with the popular pressure-compensated system. Author (GRA)

N73-15086# ESB, Inc., Yardley, Pa.
BA-528( )/U MECHANICALLY RECHARGEABLE ZINC-AIR BATTERY Final Report
F. P. Malaspina, W. J. Martini, R. P. Niederberger, T. W. Blickwedel, and R. J. McCormick Aug. 1972 262 p
(Contract DAAB07-69-C-0248; DA Proj. 1T6-63702-D-G10)
(AD-749779; ECOM-0248-F) Avail: NTIS CSCL 10/3

The report presents the results from the development of the zinc air battery which is mechanically rechargeable by inserting new zinc anodes. The battery delivers an average of 105 A. H. under continuous discharge of 8.3 amps at 72 F. The report discusses the design and development of feasibility type model, construction techniques and the test results. GRA

N73-15087# Naval Ordnance Lab., White Oak, Md.
LIST OF BATTERIES FOR US NAVAL WEAPONS
Benjamin F. Larrick 28 Sep. 1972 37 p
(AD-751018; NOLTR-72-213) Avail: NTIS CSCL 10/3

A list of the batteries used in U. S. Naval weapons under the cognizance of the Naval Ordnance Systems Command is presented. This list is cross-referenced with the weapons in which these batteries are used. The Federal Stock Number, specification and drawing numbers, manufacturer, and electrochemical system are given for each battery. Author (GRA)

N73-15088# Battelle Columbus Labs., Ohio.
SIMULATED ORBITAL LIFE TESTS FOR SPACECRAFT CELLS. PART 2: AUTOMATICALLY ACQUIRED DATA, REVIEW, AND RECOMMENDATIONS
Earl A. Roeger, Ralph E. Thomas, John McCallum, John N. Waite (Cryptanalytic Computer Sci.), and Gerald H. Miller Aug. 1972 35 p refs
(Contracts AF 33(615)-3701; F33615-69-C-1537; AF Proj. 3145)
(AD-748251; AFAPL-TR-71-74-Pt-2) Avail: NTIS CSCL 10/3

Content, availability, and recommended procedures for analysis of the data automatically acquired during 4-1/2 years of simulated orbital life testing of nickel cadmium spacecraft cells are described. A sample of the approximately 1,000,000 records that are stored on magnetic tape is included and summary tables list documented conditions that may have yielded discontinuities, irregularities, or biases in the record data. Recommendations for data analysis by empirical, statistical, and physical methods are provided. The empirical method attempts to identify all possible indicators associated with failed cells. The physical methods examine the data, or its form for regular and irregular trends, and explain these trends by cause and effect relationships and underlying physical concepts. GRA

N73-15089# American Univ., Washington, D.C.
RESEARCH ON ELECTROCHEMICAL ENERGY CONVERSION SYSTEMS Interim Progress Report, Oct. 1971 - Apr. 1972
Robert T. Foley and Alane A. Adams Jul. 1972 27 p refs
(Contract DAAK02-72-C-0084; DA Proj. 1T0-61102-A-34A)
(AD-750152; IPR-1) Avail: NTIS CSCL 10/2

The research concerns electrochemical energy conversion systems. The investigation of the corrosion characteristics of fuel-cell electrolytes considered materials of construction for use in phosphoric acid as well as electrolytes alternative to phosphoric acid. Tantalum coatings are being studied for use in phosphoric acid and poly-phosphates are being considered as suitable electrolytes without the corrosivity of phosphoric acid. The use of organic electrolytes such as gamma-butyrolactone solutions of lithium perchlorate appears feasibile on a qualitative basis from some preliminary experiments on the anodic oxidation of propane. Author (GRA)

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N73-15090*# Smithsonian Institution, Washington, D.C.
SATELLITE (IRLS) TRACKING OF ELK Final Report
Helmut K. Buechner 11 Oct. 1972 21 p refs
(Contract NASw-1983)
(NASA-CR-130301) Avail: NTIS HC $3.25 CSCL 06C

The practicability of tracking free roaming animals in natural environments by satellite systems is reported. Satellite systems combine continuous tracking with simultaneous monitoring of physiological and environmental parameters through a combination of radio tracking and biotelemetric ground systems that lead to a better understanding of animal behavior and migration patterns. G.G.

N73-15091*# BioTechnology, Inc., Arlington, Va.
BIOASTRONAUTICS DATA BOOK, SECOND EDITION
James F. Parker, Jr., ed. and Vita R. West, ed. Washington NASA 1973 938 p refs Sponsored in part by NASA and ONR
(Contract N00014-67-C-0526)
(NASA-SP-3006; AD-749887; LC-72-600293) Avail: NTIS MF $0.95; SOD HC $7.50 CSCL 06P

The effects of atmospheric pressure and temperature and sustained and rotary acceleration on human performance are examined. Stress effects on various body systems are emphasized, including the respiratory, vestibular, visual, and auditory systems. The environmental control of closed ecological systems is also investigated. For individual titles, see N73-15092 through N73-15111.

N73-15092* Ohio State Univ., Columbus.
BAROMETRIC PRESSURE **c05**
Charles E. Billings *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 1-34 (For availability see N73-15091 06-04)
CSCL 06S

The effects of alterations in barometric pressure on human beings are described. Human tolerances for gaseous environments and low and high barometric pressure are discussed, including effects on specific areas, such as the ear, lungs, teeth, and sinuses. Problems due to trapped gas within the body, high dynamic pressures on the body, and blasts are also considered. J.A.M.

N73-15093* Ohio State Univ., Columbus.
ATMOSPHERE **c05**
Charles E. Billings *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 35-63 refs (For availability see N73-15091 06-04)
CSCL 06S

Properties of elements and compounds are considered which make up or may be added to a gaseous environment suitable for humans. Oxygen and carbon dioxide are emphasized; nitrogen and the noble gases are also cited. Other gaseous compounds, such as carbon monoxide, methane, and sulfur hexafluoride, are briefly mentioned. J.A.M.

N73-15094* AiResearch Mfg. Co., Los Angeles, Calif.
TEMPERATURE **c05**
P. J. Berenson and W. G. Robertson *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 65-148 refs (For availability see N73-15091 06-04)
CSCL 06S

The problems in human comfort in heat stress are emphasized, with less emphasis placed upon cold exposure problems. Physiological parameters related to human thermal interactions are discussed, as well as data concerning thermal protective clothing. The energy balance equation, heat transfer equation, thermal comfort, heat stress, and cold stress are also considered. A two node model of human temperature regulation in FORTRAN is appended. J.A.M.

N73-15095* Waterloo Univ. (Ontario).
SUSTAINED LINEAR ACCELERATION **c05**
T. Morris Fraser *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 149-190 refs (For availability see N73-15091 06-04)
CSCL 06S

The subjective effects of sustained acceleration are discussed, including positive, negative, forward, backward, and lateral acceleration effects. Physiological effects, such as retinal and visual response, unconsciousness and cerebral function, pulmonary response, and renal output, are studied. Human tolerance and performance under sustained acceleration are ascertained. J.A.M.

N73-15096* Waterloo Univ. (Ontario).
ROTARY ACCELERATION **c05**
T. Morris Fraser *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 191-219 refs (For availability see N73-15091 06-04)
CSCL 06S

Rotary acceleration is found to be a manifestation of angular acceleration, and is always present during steady state spinning or tumbling, even when the angular velocity is constant. Subjective reactions and tolerances, performance, physiological effects, and pathological effects are reviewed for rotary acceleration. Thresholds for stimulation perception by angular acceleration in man are presented in tabular form. J.A.M.

N73-15097* Michigan Univ., Ann Arbor.
IMPACT **c05**
Richard G. Snyder *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 221-295 refs (For availability see N73-15091 06-04)
CSCL 06S

Impact, emergency escape and crash survival protection are studied. Accleration, the G system of units, data interpretation, and human tolerance limits are summarized, along with physiological and biochemical response to impact. Biomechanical factors of impact are also cited. J.A.M.

N73-15098* Litton Systems, Inc., Beverly Hills, Calif.
VIBRATION **c05**
Richard J. Hornick *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 297-348 refs (For availability see N73-15091 06-04)
CSCL 06S

Man's reactions to vibration are emphasized rather than his reactions to the vibrational characteristics of vehicles. Vibrational effects studied include: performance effects reflected in tracking proficiency, reaction time, visual impairment, and other measures related to man's ability to control a system; physiological reactions; biodynamic responses; subjective reactions; and human tolerance limits. Technological refinements in shaker systems and improved experimental designs are used to validate the data. J.A.M.

N73-15099* National Aeronautics and Space Administration, Washington, D.C.
WEIGHTLESSNESS **c05**
Charles A. Berry *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 349-415 refs (For availability see N73-15091 06-04)
CSCL 06S

Weightlessness effects on physiological systems are summarized, including cardiovascular responses, hematological effects, work capacity (exercise tolerance), respiratory responses, skeletal responses, neuromuscular changes, vestibular responses, metabolism, endocrine and electrolyte responses, and weight loss. The nature of the adaptive response to space flight and microbial changes are also discussed. The effects of zero gravity upon performance are ascertained, and the physiological effects of weightlessness are counteracted. J.A.M.

N73-15100* New England Deaconess Hospital, Boston, Mass.
IONIZING RADIATION **c05**
Shields Warren and Douglas Grahn (ANL) *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 417-454 refs (For availability see N73-15091 06-04)
CSCL 06R

The penetrating ionizing space radiations are found to be extremely diverse in the energy range of both their particulate and their electromagnetic components. Radiation terms and measures and ionizing radiation classes and sources are presented. Whole body radiation effects are examined, including radiation intensity and rate effectiveness factors. Radiation effects on specific body systems, such as blood, skin, visual, and reproductive systems are also discussed. J.A.M.

N73-15101* SysteMed Corp., Dayton, Ohio.
TOXICOLOGY
J. W. MacEwen *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 455-487 refs (For availability see N73-15091 06-04)
CSCL 06T

Oxygen toxicity is examined, including the effects of oxygen partial pressure variations on toxicity and oxygen effects on ozone and nitrogen dioxide toxicity. Toxicity of fuels and oxidizers, such as hydrazines, are reported. Carbon monoxide, spacecraft threshold limit values, emergency exposure limits, spacecraft contaminants, and water quality standards for space missions are briefly summarized. J.A.M.

N73-15102* International Business Machines Corp., New York.
RESPIRATORY SYSTEM
Roscoe G. Bartlett, Jr. *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 489-531 refs (For availability see N73-15091 06-04)
CSCL 06P

The general anatomy and function of the human respiratory system is summarized. Breathing movements, control of breathing, lung volumes and capacities, mechanical relations, and factors relevant to respiratory support and equipment design are discussed. J.A.M.

N73-15103* Naval Aerospace Medical Research Lab., Pensacola, Fla.
THE VESTIBULAR SYSTEM
Ashton Graybiel *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 533-609 refs (For availability see N73-15091 06-04)
CSCL 06P

The end organs, central nervous system connections, and static and dynamic characteristics of the vestibular system are presented. Vestibular servation in man and vestibular side effect prevention from space missions involving artificial gravity generation are also considered. Vestibular models and design criteria for rotating space vehicles are appended. J.A.M.

N73-15104* California Univ., San Diego.
VISION
John H. Taylor *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 611-665 refs (For availability see N73-15091 06-04)
CSCL 06P

Some data on human vision, important in present and projected space activities, are presented. Visual environment and performance and structure of the visual system are also considered. Visual perception during stress is included. J.A.M.

N73-15105* Illinois Univ., Urbana.
AUDITORY SYSTEM
Harlow W. Ades *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 667-691 refs (For availability see N73-15091 06-04)
CSCL 06P

The physical correlations of hearing, i.e. the acoustic stimuli, are reported. The auditory system, consisting of external ear, middle ear, inner ear, organ of Corti, basilar membrane, hair cells, inner hair cells, outer hair cells, innervation of hair cells, and transducer mechanisms, is discussed. Both conductive and sensorineural hearing losses are also examined. J.A.M.

N73-15106* Aberdeen Proving Ground, Md.
NOISE AND BLAST c05
David C. Hodge and Georges R. Garinther *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 693-750 refs (For availability see N73-15091 06-04)
CSCL 06S

Noise and blast environments are described, providing a definition of units and techniques of noise measurement and giving representative booster-launch and spacecraft noise data. The effects of noise on hearing sensitivity and performance are reviewed, and community response to noise exposure is discussed. Physiological, or nonauditory, effects of noise exposure are also treated, as are design criteria and methods for minimizing the noise effects of hearing sensitivity and communications. The low level sound detection and speech reception are included, along with subjective and behavioral responses to noise. J.A.M.

N73-15107* Massachusetts Inst. of Tech., Cambridge.
HUMAN CONTROL CAPABILITIES c05
Laurence Retman Young *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 751-806 refs (For availability see N73-15091 06-04)
CSCL 05E

The capabilities and limitations of man as an element in a closed loop control system under normal environmental conditions are described. Controller characteristics are enumerated, using manual control, quasilinear models, pilot opinion and ratings, compensatory tracking, optimum control models, motion cues, multiple input tracking, multiple loop tracking, transmission delays, and adaptive manual control. Various controls, manipulators, and displays are also considered. J.A.M.

N73-15108* National Aeronautics and Space Administration, Washington, D.C.
ATMOSPHERE CONTROL c05
Walton L. Jones and A. L. Ingelfinger *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 807-845 refs (For availability see N73-15091 06-04)
CSCL 06K

Atmospheric control studies emphasized the carbon dioxide problem. Trace contaminants are removed by solid adsorbents and by catalytic oxidation. Humidity control and storage systems for atmospheric constituents are briefly summarized. J.A.M.

N73-15109* Webb Associates, Yellow Springs, Ohio.
WORK, HEAT, AND OXYGEN COST c05
Paul Webb *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 847-879 refs (For availability see N73-15091 06-04)
CSCL 05E

Human energy is discussed in terms of the whole man. The physical work a man does, the heat he produces, and the quantity of oxygen he takes from the air to combine with food, the fuel source of his energy, are described. The daily energy exchange, work and heat dissipation, oxygen costs of specific activities, anaerobic work, and working in space suits are summarized. J.A.M.

N73-15110* Indiana Univ., Bloomington. School of Medicine.
COMBINED ENVIRONMENTAL STRESSES c05
Raymond H. Murray and Michael McCally (AMRL) *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 881-914 refs (For availability see N73-15091 06-04)
CSCL 06S

Tolerance levels, physiological effects, and performance degradation during simultaneous or sequential exposures to two environmental stresses, and also three or more simultaneous stresses are described. Environmental stress combinations are characterized by four descriptors: order of occurrence, duration of exposure, severity of exposure, and type of interaction. Combined stress data and facilities for combined stress study are briefly mentioned. J.A.M.

N73-15111* National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE VEHICLE WATER-WASTE MANAGEMENT c05
Joseph N. Pecoraro *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 915-930 refs (For availability see N73-15091 06-04)
CSCL 06I

The collection and disposal of human wastes, such as urine and feces, in a spacecraft environment are performed in an

aesthetic and reliable manner to prevent degradation of crew performance. The waste management system controls, transfers, and processes materials such as feces, emesis, food residues, used expendables, and other wastes. The requirements, collection, transport, and waste processing are described. J.A.M.

N73-15112# National Research Council of Canada, Ottawa (Ontario).
RESEARCH AND DEVELOPMENT OF RADIATION-PROTECTIVE AGENTS (NOW BECOMING AVAILABLE AS ORAL DRUGS)
Senya Akaboshi 1972 15 p refs Transl. into ENGLISH from Genshiryoky Kogyo (Tokyo), v. 17, no. 2, 1971 p 51-54
(NRC-TT-1609) Avail: NTIS HC $3.00

The research on the protection of humans from radiation injuries by chemical means is reported. An outline to a previously published guide to radiation agents is included, and the oral administration of radiation protective drugs is discussed. F.O.S.

N73-15113# Joint Publications Research Service, Arlington, Va.
PSYCHOLOGICAL COMPATIBILITY IN INTERPLANETARY FLIGHT
A. A. Leonov and V. I. Lebedev 2 Jan. 1973 20 p refs Transl. into ENGLISH from Vopr. Filosofii (Moscow), no. 9, 1972 p 14-27
(JPRS-57878) Avail: NTIS HC $3.00

The problems of achieving harmony in the work of crews in running spaceships and their systems during lengthy stays of small groups of men within the limited confines of spaceships on interplanetary flights are discussed. Author

N73-15114*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
WIND TUNNEL INVESTIGATION OF THE EFFECT OF HIGH RELATIVE VELOCITIES ON THE STRUCTURAL INTEGRITY OF BIRDS
Donald L. Bresnahan Dec. 1972 18 p refs
(NASA-TM-X-68163; E-7272) Avail: NTIS HC $3.00 CSCL 06C

An experimental investigation was conducted in a supersonic wind tunnel to determine the effect a sudden high velocity headwind had on the physical deformation and structural breakup characteristics of birds. Several sizes of recently killed birds were dropped into the test section at free-stream Mach numbers ranging from 0.2 to 0.8 and photographed with high-speed motion-picture cameras. These conditions simulated flow conditions encountered when birds are ingested into the inlets of high speed aircraft, thereby constituting a safety hazard to the aircraft and its occupants. The investigation shows that, over the range of headwind conditions tested, the birds remained structurally intact and did not suffer any appreciable deformation or structural breakup. Author

N73-15115*# Louisiana State Univ., Baton Rouge. Dept. of Chemical Engineering.
SINGLE-CELL PROTEIN FROM WASTE CELLULOSE Final Report
C. E. Dunlap and C. D. Callihan Jan. 1973 81 p refs
(Grant NGL-19-001-024)
(NASA-CR-130300) Avail: NTIS HC $6.25 CSCL 06M

The recycling, reuse, or reclamation of single cell protein from liquid and solid agricultural waste fibers by a fermentation process is reported. It is shown that cellulose comprises the bulk of the fibers at 50% to 55% of the dry weight of the refuse and that its biodegradability is of prime importance in the choice of a substrate. The application of sodium hydroxide followed by heat and pressure serves to de-polymerize and disrupt lignin structure while swelling the cellulose to increase water uptake and pore volume. Some of the lignin, hemi-celluloses, ash, and cellulose of the material is hydrolized and solubilized. Introduction of microorganisms to the substrate fibers mixed with nutrients produces continuous fermentation of cellulose for further protein extraction and purification. G.G.

N73-15116*# National Aeronautics and Space Administration, Washington, D.C.
EVOLUTION, GRAVITATION, WEIGHTLESSNESS
P. A. Korzhuyev Jan. 1973 121 p refs Transl. into ENGLISH of the book "Evolyutsiya, Gravitatsiya, Nevesomodt" Moscow, Nauka Press, 1971
(NASA-TT-F-730) Avail: NTIS HC $3.00 CSCL 06P

Evidence is presented that prolonged weightlessness during space flights will have very harmful effects on the human body. Since passive adaptation to weightlessness is impossible for man, methods must be found to prevent those effects. Author

N73-15117*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECT OF PROLONGED BEDREST AND PLUS Gz ACCELERATION ON PERIPHERAL VISUAL RESPONSE TIME
Richard F. Haines Washington Jan. 1973 66 p refs
(NASA-TN-D-7161; A-4566) Avail: NTIS HC $3.00 CSCL 06S

Peripheral visual response time changes during +G sub z acceleration following fourteen days of bedrest are considered as well as what effect prolonged bedrest has upon this response. Eighteen test lights, placed 10 deg apart along the horizontal meridian of the subject's field of view, were presented in a random sequence. The subject was instructed to press a button as soon as a light appeared. Response time testing occurred periodically during bedrest and continuously during centrifugation testing. The results indicate that: (1) mean response time is significantly longer to stimuli imaged in the far periphery than to stimuli imaged closer to the line of sight; (2) mean response time at each stimulus position tends to be longer at plateau g than during the preacceleration baseline period; (3) mean response time tends to lengthen as the g level is increased; (4) peripheral visual response time during +G sub x acceleration at 2, 3.2, and 3.8 g was not a reliable advanced indicator that blackout was going to occur; and (5) the subject's field of view collapsed rapidly just before blackout. Bedrest data showed that the distribution of response times to stimuli imaged across the subject's horizontal retinal meridian remained remarkably constant from day to day during both the bedrest and recovery periods. Author

N73-15118*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
BIOLOGICAL EFFECTS OF FUEL AND EXHAUST COMPONENTS FROM SPACECRAFT DESCENT ENGINES EMPLOYING HYDRAZINE
M. E. Lehwalt, F. H. Woeller, and V. I. Oyama Washington Jan. 1973 29 p refs
(NASA-TM-X-2714; A-4279) Avail: NTIS HC $3.00 CSCL 06P

The effect of the products of the Viking terminal descent engine fuel upon possible extraterrestrial life at the Martian landing site is examined. The effects of the engine exhaust, the hydrazine fuel, and the breakdown products of the latter on terrestrial microorganisms have been studied. The results indicate that the gaseous exhaust products would probably not be hazardous to microorganisms, but that liquid hydrazine would be lethal. Author

N73-15119# Oak Ridge National Lab., Tenn.
EFFECTS OF WEIGHTLESSNESS ON SIMPLE LIFE FORMS IN BIOSATELLITE 2
F. J. deSerres 1972 8 p Presented at 56th Ann. Meeting of the Federation of Am. Soc. for Exptl. Biol., Atlantic City, N. J., 9 Apr. 1972 Sponsored by AEC
(Conf-720441-1) Avail: NTIS

Biosatellite 2 experiments, designed to measure the effects of weightlessness and weightlessness in combination with known doses of radiation on biological processes, are presented. Attempts were made to determine if weightlessness affected all organisms in the same manner and which, if any, would not function properly. E.H.W.

N73-15120# Rochester Univ., N.Y. Dept. of Radiation Biology and Biophysics.
HUMAN RESPONSES TO MICROWAVE IRRADIATION: A REVIEW AND EVALUATION OF PUBLISHED REPORTS
William M. Houk 1972 22 p refs Presented at Aerospace Med. Association Meeting, Bal Harbour, Fla., 8 May 1972

Sponsored by AEC
(UR-3490-29; Conf-720542-1) Avail: NTIS

The biological effects of microwave irradiation on man discussed include: neurasthenic responses to apparent low exposure levels and suspected behavioral changes (as reported in Soviet literature); neuroendocrine effects; cataractogenesis (developed in literature from the United States); cardiovascular changes; and other effects. Reports on the human subject are comparatively few, are usually conflicting, statistical methods employed are often dubious or non-existent, and relation to control populations are most often not evident. The need for a unified continuing compilation of occupational health data, as well as the need for appropriately defined and conducted retrospective and prospective epidemiological studies is recognized and discussed. Further, the need for identifying and clinical monitoring of higher at risk exposure groups with suggested modes of accomplishing this is presented. Author (NSA)

N73-15121# Rochester Univ., N.Y. Dept. of Radiation Biology and Biophysics.

THEORETICAL AND EXPERIMENTAL MODELS FOR DUST DEPOSITION AND RETENTION IN MAN

Paul E. Morrow 1972 33 p refs Sponsored by AEC
(UR-3490-169) Avail: NTIS

A review is presented of respiratory models used in studying the hazards of air pollution. The models discussed include nasal deposition and retention, tracheobronchial deposition and retention, parenchymal deposition and retention, and respiratory system. F.O.S.

N73-15122# Rochester Univ., N.Y. Dept. of Radiation Biology and Biophysics.

THYROID PATHOPHYSIOLOGY OF MICROWAVE RADIATION

William C. Milroy and Sol M. Michaelson 1972 22 p refs Presented at the Aerospace Med. Assoc. Meeting, Bal Harbour, Fla., 8-11 May 1972 Sponsored by AEC
(VR-3490-149; Conf-720542-3) Avail: NTIS

A wide variety of biological effects of microwave radiation were reported. One interesting effect which was noted but which is neither well understood nor well investigated is alteration in the neuroendocrine response of exposed organisms, both humans and laboratory animals. This study was designed to investigate the response of the pituitary-thyroid axis to microwave radiation. Rats exposed to various regimens of microwave radiation were evaluated in terms of their thyroid and thyrotropic acitivity. No alterations in structure or function were noted which could be attributed to a specific effect of microwave radiation. Those alterations which were detected were felt to represent nonspecific reactions of age, heat, and stress. Author

N73-15123# Rochester Univ., N.Y. Dept. of Radiation Biology and Biophysics.

RELEVANCY OF EXPERIMENTAL STUDIES OF MICROWAVE INDUCED CATARACTS TO MAN

Sol M. Michaelson 1972 36 p refs Sponsored by AEC
(UR-3490-103) Avail: NTIS

An extensive literature review is presented of studies which have attempted to assess the relationship of exposure to microwaves and the subsequent development of cataracts. The studies include numerous investigations in animals and several surveys among human populations. On the basis of these studies the following conclusions are made: (1) The estimated exposure levels with which clinically significant cataracts have been associated have generally been quite high and well above 100 mW/sq cm. (2) In general the studies are only qualitative and do not give any relation between the actual power level and pathology. (3) The individuals studied in the surveys could have been exposed to ionizing radiation just as well as microwaves. (4) The health hazard posed by the possibility of microwave induced cataract formation would appear minor because the power densities required for opacification are seven to eight times the maximum permissible exposure levels suggested for human exposure (10 mW/sq cm). D.L.G.

N73-15124# Defence Research Information Centre, Orpington (England).

CHEMICAL PROTECTION IN MIXED GAMMA-NEUTRON IRRADIATION WITH DIFFERENT NEUTRON CONTRIBUTIONS IN THE ABSORBED DOSE

M. V. Vasin, V. A. Kozlov et al Nov. 1972 9 p refs Transl. into ENGLISH from Probl. of Cosmic Biol. (Moscow) p 132-136
(DRIC-Trans-2961; BR-30325) Avail: NTIS HC $3.00

The effectiveness of pharmacochemical protective substances (AET, cystalos, 5-MOT and cysteamine) as the neutron component increases was investigated. Experiments were carried out on non-pedigree female white mice weighing from 19 to 22 g kept under normal animal-house conditions and fed on a standard diet. The animals were subjected to mixed gamma-neutron radiation, first with the neutron contribution in the absorbed dose about 90%, the dose rate being 12 rad/min and the dose 260 to 290 rad; and then with the neutron component about 35%, the dose rate being 30 rad/min and the dose 560 rad. The radioprotective effect of the substances was assessed from the chemical picture of radiation damage, mortality, and the mean survival time of the animals which died. Author (ESRO)

N73-15125# Defence Research Information Centre, Orpington (England).

A STUDY OF THE RADIOPROTECTIVE ACTION OF A POLYMER SALT OF CYSTAMINE AND SULPHOPROPYL ESTER OF DEXTRAN

M. N. Trushina, K. P. Khomyakov et al Nov. 1972 8 p refs Transl. into ENGLISH from Vopr. Med. Khim. (Moscow), vol. 4, no. 9, 1969 p 195-198
(DRIC-Trans-2963; BR-30327) Avail: NTIS HC $3.00

The addition of cysteamine to a sulfopropyl ester of dextran gives increased protection to irradiated mice especially if doses of 500 mg/kg are administered 10 to 15 minutes before irradiation. It was also found that the polymer complex based on dextran and cysteamine has a further advantage in that the duration of its effect is more prolonged than that of cysteamine dihydrochloride since it could be administered up to one hour before irradiation. Author (ESRO)

N73-15126# Defence Research Information Centre, Orpington (England).

MUTE GAS BUBBLES AND THEIR ROLE IN DECOMPRESSION PATHOLOGY

M. P. Elinskii Jul. 1972 8 p refs Transl. into ENGLISH from Tr. Voenno-Med. Akad. (Moscow), no. 9, 1969 p 56-59
(AD-748229; DRIC-TRANS-2789; BR-30160) Avail: NTIS CSCL 06/19

The presented data shows that in the absence of clinically expressed signs of decompression sickness in the nervous system, definite morphological changes can result from gas forming in the body after decompression. From this it follows that the body possesses a definite degree of tolerance in relation to the post-decompression aeroembolism whose excess leads to an expressed disease. When a person feels unwell, or when there is an excess of local sensations of sickness in people subjected the day before to the influence of increased or lowered atmospheric pressure, it is essential that careful and thorough research be carried out to expose effaced forms of decompression sickness, provoked by mute gas bubbles. GRA

N73-15127# Naval Submarine Medical Research Lab., Groton, Conn.

VISUAL EVOKED RESPONSES FOR DIVERS BREATHING VARIOUS GASES AT DEPTHS TO 1200 FEET Medical Research Progress Report No. 3

Jo Ann S. Kinney, Christine L. McKay, and S. M. Luria 23 Mar. 1972 18 p refs
(AD-749325; NSMRL-705) Avail: NTIS CSCL 06/19

Visual evoked responses were recorded from men subjected to hyperbaric conditions simulating 400, 700, 900, and 1200 ft of seawater in a saturation dive conducted at the Institute for Environmental Medicine, University of Pennsylvania, Philadelphia, Pa. Various breathing mixtures were used. At any given depth the VERs were the same for helium-oxygen and neon-oxygen but were sizeably reduced with nitrogen-oxygen, both in amplitude and in regularity. The possibility of an overall loss in VER amplitude with depth deserves further study since one subject did show such a decrement while the other did not. Author (GRA)

N73-15128# School of Aerospace Medicine, Brooks AFB, Tex.
CYTOLOGIC ASPECT OF RF RADIATION IN THE MONKEY, PART 1
John E. Prince, Llewellyn H. Mori, James W. Frazer, and John C. Mitchell 1972 5 p refs
(AD-749583; SAM-TR-71-445-PT-1) Avail: NTIS CSCL 06/18

A circulating lymphocytoid cell having a high mitotic potential was obtained from monkeys (M. mulatta) 71 hrs after exposure to 10-27 MHz electromagnetic radiation for 30 min. at a power density of 1.32 w/cm2. Exposure was made in a coaxial guide powered by a 50 KWP transmitter operated in a pulsed mode (duty cycle of 17%). Author (GRA)

N73-15129# Army Aeromedical Research Lab., Fort Rucker, Ala.
[RESEARCH IN SUPPORT OF AVIATION MEDICINE] Annual Progress Report, 1 Jul. 1971 - 30 Jun. 1972
Robert W. Bailey Jul. 1972 106 p
(DA Proj. 3A062110-A-819)
(AD-749456) Avail: NTIS CSCL 06/5

Contents: Technical and administrative support to Army aeromedical research; Direct field research support to immediate Army aeromedical problems; Medical research applied to the problems in Army aviation; Research of visual problems medically significant to Army aviation; Research of psycho-acoustical problems medically significant to Army aviation; Research psychology applied to medically significant problems in Army aviation; Research of bioengineering problems medically significant to Army aviation; The investigation of new generation microphones for the improvement of military voice communication systems. GRA

N73-15130# Army Medical Research Lab., Fort Knox, Ky.
[RESEARCH IN SUPPORT OF MILITARY MEDICINE] Annual Progress Report, 1 Jul. 1971 - 30 Jun. 1972
30 Jun. 1972 111 p refs
(AD-749440) Avail: NTIS CSCL 06/18

The research and development effort is concerned with studies in sensory psychophysiology, the biological effects of laser radiation, and methodology related to the preservation, transfusion, collecting, processing, and shipment of human blood. The progress during fiscal year 1972 and the current status of the various work units are reported herein. Author (GRA)

N73-15131# Naval Medical Research Inst., Bethesda, Md.
BIBLIOGRAPHY OF REPORTED BIOLOGICAL PHENOMENA 'EFFECTS' AND CLINICAL MANIFESTATIONS ATTRIBUTED TO MICROWAVE AND RADIO-FREQUENCY RADIATION Interim Report
Zorach R. Glaser 20 Apr. 1972 106 p refs Revised
(MF12524015)
(AD-750271; IR-2-Rev) Avail: NTIS CSCL 06/18

More than 2300 references on the biological responses to radio frequency and microwave radiation, published up to April 1972, are included in this bibliography of the world literature. Particular attention has been paid to the effects on man of non-ionizing radiation at these frequencies. The citations are arranged alphabetically by author, and contain as much information as possible so as to assure effective retrieval of the original documents. Soviet and East European literature is included in detail. An outline of the effects which have been attributed to radio frequency and microwave radiation is included as Chapter 1. The revised report (which supersedes DDC report (AD-734391)) is updated with the inclusion of three supplementary listings, and has incorporated many corrections and additions to the original 2100 citations. Author (GRA)

N73-15132# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE FUNCTIONAL STATE OF THE VISUAL AND VESTIBULAR ANALYZERS OF THOSE WHO WORK WITH SMALL DOSES OF IONIZING EMISSIONS
Ts. P. Medvedovskaya and V. N. Shepelev 2 Aug. 1972 10 p refs Transl. into ENGLISH from Gig. Tr. Prof. Zabol. (Moscow), no. 9, 1970 p 44-46
(AD-750499; FTD-MT-24-99-72) CSCL 06/18

A study of 199 persons working with the VVP-M research reactor integral operator dose 15 to 20 rem is reported. No significant changes in functional state of the visual and vestibular analyzers were detected. Reversible changes such as reduced sensitivity to red and green, enlarged blind spot, depression of vestibular function, and reduced size and altered blood pressure in vessels of the fundus oculi reflect changes in the functional state of the higher nervous system, and of the cerebral cortex in particular. Author (GRA)

N73-15133# Naval Medical Research Inst., Bethesda, Md.
A BIBLIOGRAPHY OF THE ROLE OF THE VESTIBULAR APPARATUS UNDER WATER AND PRESSURE: CONTENT-ORIENTED AND ANNOTATED Progress Report
Robert S. Kennedy 10 Aug. 1972 136 p refs
(AD-750686; PR-1) Avail: NTIS CSCL 06/19

The report contains approximately 965 references dealing with the role of the vestibular apparatus in compressed air work. The references are sorted by subject matter into six categories: Vestibular symptomatology as a sign of decompression sickness; Clinical investigation of vestibular symptomatology; Tests of positive function of vestibular apparatus; Perceptual illusions occasioned by the environment; The use of the vestibular system as an inertial guidance system; and auditory studies which have relevance for understanding vestibular function underwater. Author (GRA)

N73-15134# Armed Forces Radiobiology Research Inst., Bethesda, Md.
BLOOD PO2 AND pH IN MONKEYS AFTER INCAPACITATING DOSES OF IONIZING RADIATION
J. W. Thorp Jun. 1972 19 p refs
(DNA Proj. NWER-XAXM)
(AD-750681; AFRRI-TN72-3) Avail: NTIS CSCL 06/18

Aortic blood PO2 and pH and internal jugular blood PO2 were measured continuously in monkeys (Macaca mulatta) that received a 3000-rad midline tissue dose pulse of mixed gamma-neutron radiation. Immediately after irradiation the aortic blood PO2 and pH increased slightly (5 to 10 torr and 0.05 pH unit, respectively); these changes were consistent with earlier reports that monkeys hyperventilated after similar irradiation. Venous blood PO2 did not change after irradiation. It was concluded that lack of oxygen in the blood does not contribute to radiation-induced early transient incapacitation (ETI). If brain hypoxia does cause ETI, it must result from inadequate blood supply to all or part of the brain. Author (GRA)

05 BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N73-15135*# Southwest Research Inst., San Antonio, Tex.
ASSISTANCE TO NASA IN BIOMEDICAL AREAS OF THE TECHNOLOGY UTILIZATION PROGRAM Monthly Report, 1-30 Nov. 1972
Nov. 1972 108 p
(Contract NASw-1867; SwRI Proj. 13-2538)
(NASA-CR-129998) Avail: NTIS HC $7.50 CSCL 06B

The activities of the applications team are reported for November 1972. Summaries are included of problems, problem statements, searches, application engineering, and technology application. F.O.S.

N73-15136# Defence Research Board, Ottawa (Ontario).
DRB AVIATION MEDICAL RESEARCH UNIT REPORTS, VOLUME 1, 1964-1968
Geoffrey Melvill Jones, comp. May 1971 206 p refs Prepared jointly with McGill Univ.
(DR-208-Vol-1) Avail: NTIS HC $12.50

Physiological research on sensory responses to visual stimuli and on neural control of functional muscle movements during space flight is reported. For individual titles, see N73-15137 through N73-15154.

N73-15137 Defence Research Board, Ottawa (Ontario).
DYNAMICS OF THE SEMICIRCULAR CANALS COMPARED IN YAW, PITCH AND ROLL
Geoffrey Melvill Jones, W. Barry, and N. Kowalsky *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1 May 1971 p 1-11 refs Submitted for publication (For availability see N73-15136 06-05)

Treating the semicircular canal system as a 3-D sensing device, experiments were performed to compare the patterns of response to rotational stimuli in the yaw, pitch and roll planes of the head. The method of post-rotational stimulation on an electronically controlled turntable was used, both subjective cupulometry and objective measurement of slow phase eye angular velocity being employed to measure the time course of decay in response. The yaw-pitch and yaw-roll differences were highly significant (P less than 0.001). It is concluded that the effective time constants of post rotational decay in the planes of pitch and roll are considerably shorter than in yaw. In the context of aviation this implies a considerably greater rate of development of error in response to rotational stimuli in pitch and roll than in yaw. Author

N73-15138 Defence Research Board, Ottawa (Ontario).
PREDOMINANCE OF ANTI-COMPENSATORY OCULOMOTOR RESPONSE DURING RAPID HEAD ROTATION
Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1 May 1971 p 12-19 refs Submitted for publication (For availability see N73-15136 06-05)

Experiments with human subjects are described which show that when the head is jerked with high angular velocity, say to the right, large anti-compensatory flicks drive the eyes well over in the leading direction, in this case to the right, where they remain until the head slows down. Then the expected compensatory response to the left begins to appear. If the high head angular velocity is artificially maintained, as on a turntable, the expected compensatory response may be virtually eliminated for several seconds, presumably owing to prolonged action of a strongly maintained anti-compensatory response. This phenomenon can occur in the rolling plane and has been demonstrated during flight in the initial stages of a rapid rolling manoeuvre. Presumably consequent failure of retinal image stabilisation could cause serious impairment of visual acuity at this critical moment. Author

N73-15139 Defence Research Board, Ottawa (Ontario).
THE CRITICAL DEPENDENCE OF SEMI-CIRCULAR CANAL FUNCTION UPON ITS PHYSICAL DIMENSIONS
Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1 May 1971 p 20-25 refs Submitted for publication (For availability see N73-15136 06-05)

The main functional role of the canals is seen as one of angular velocity transduction, with this particular capability being critically dependent upon the actual canal dimensions. It seems that natural selection has nicely adapted these dimensions by very small, but altogether appropriate changes in canal size, such that the frequency range of velocity transducing characteristics of the canal is always matched to the likely range of frequencies to which the head will be exposed in natural life. It seems as if the evolutionary process has preferred to employ mechanical, rather than neural, integration of head angular acceleration, and that this capability has been largely brought about by precise adjustment of critical canal dimensions. Author

N73-15140 Defence Research Board, Ottawa (Ontario).
DISTURBANCE OF OCULOMOTOR CONTROL IN FLIGHT
Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1 May 1971 p 26-34 refs Submitted for publication (For availability see N73-15136 06-05)

An over-all analysis of the physiological processes contributing to stabilization of the retinal image reveals four main sensory and three main motor information channels. The three motor outputs operate on three discrete anatomical platforms described as the eye-in-skull, the skull-on-body and the body-in-space. Detailed considerations of the visual tracking and vestibulo-ocular mechanisms disclose a number of limitations imposed on the over-all system by the flight environment. Specifically, those here considered are the limited frequency response of visual tracking, virtual absence of visual tracking in the roll plane, the vestibular errors introduced by prolonged turning and the predominance of an anti-compensatory vestibulo-ocular response during rapid head rotation. Author

N73-15141 Defence Research Board, Ottawa (Ontario).
SPATIAL AND DYNAMIC ASPECTS OF VISUAL FIXATION
Geoffrey Melvill Jones and J. H. Milsum *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1 May 1971 p 35-51 refs Submitted for publication (For availability see N73-15136 06-05)

The physiological processes concerned with the difficult dynamic task of fixating the retinal image during normal body and head movement are examined with a control engineering perspective. Spatial relationships between the two main system inputs (visual and vestibular) and three main outputs (operating on the eye-in-skull, skull-on-body, and body-in-space platforms) are examined in the context of the geometry of the environment with the aid of an information flow diagram. From dynamic considerations a picture emerges in which the visual tracking system has adequate accuracy and dynamic range for following most naturally moving objects when the head is still. But with head free, the added perturbations of natural movement exceed these tracking capabilities. However, over the frequency range 0.1-5.0 c/s the semicircular canal subsystem then provides angular velocity information for powerful complementary servostabilization. Author

N73-15142 Defence Research Board, Ottawa (Ontario).
THEORETICAL MAN-MACHINE INTERACTION WHICH MIGHT LEAD TO LOSS OF AIRCRAFT CONTROL
J. F. Martin and Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1 May 1971 p 52-59 refs Submitted for publication (For availability see N73-15136 06-05)

A theoretical model of a pilot-aircraft interaction wherein the pilot relies entirely upon his sense of the relative gravity vector for orientation information is developed. It is shown that the illusory effects arising from motions could cause him to operate the aircraft controls in a diametrically opposite manner to what would be appropriate. This model may serve as a basis to account for otherwise unexplained losses of control in jet transport aircraft. Author

N73-15143 Defence Research Board, Ottawa (Ontario).
INFLUENCE OF EYE LID MOVEMENT UPON ELECTRO-OCULOGRAPHIC RECORDING OF VERTICAL EYE MOVEMENTS
W. Barry and Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1 May 1971 p 60-66 refs Submitted for publication (For availability see N73-15136 06-05)

The cause of an EOG artifact noted during vertical saccadic eye movements has been investigated. Records of eye movements were simultaneously obtained from electro-oculography and a movie photographic method in response to intermittent vertical saccadic changes in visual fixation. The artifact was found to run the same time course as the upper eye lid movement and is probably directly attributable to this. An argument is advanced suggesting that changes in the relative position of the eyelid and eyeball are responsible for the artifact and a simplified model of the electrical setup by which the eyeball, lids and electrodes might function is presented. Author

N73-15144 Defence Research Board, Ottawa (Ontario).
THE VESTIBULAR CONTRIBUTION TO STABILIZATION OF THE RETINAL IMAGE
Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1 May 1971 p 67-78 refs Submitted for publication (For availability see N73-15136 06-05)

The vestibulo-ocular reflex system is examined in the context of an essential backup to the visual fixation reflex. The vestibular stimulus (in this case, mainly the semicircular canal) is seen as the output from an angular velocity transducing hydrodynamic system, feeding the central nervous system with angular velocity modulated information, provided the mechanical stimulus is confined within a specified frequency range. It appears that the dynamic response of the vestibulo-ocular system improves as that of the visual tracking systems fails. The overall system is apparently superimposed by a pattern of response which insures that compensating eye muscles are stretched on average by an

amount directly related to the compensatory eye angular velocity required for image stabilization at every instant. Author

N73-15145 Defence Research Board, Ottawa (Ontario).
THE INTERDEPENDENCE OF CLINICAL NEUROLOGY AND NEUROPHYSIOLOGY: AN HISTORICAL REVIEW OF THE VESTIBULO-OCULAR REFLEX
Seymour Mishkin *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1 May 1971 p 79-91 refs Submitted for publication (For availability see N73-15136 06-05)

The historical development of the vestibulo-ocular reflex is used to indicate how major advances in neurophysiology have contributed to clinical neurology. Early advances, made within the framework of the scientific method, permitted the incorporation of empirical data into working hypotheses which could be tested at the bedside as well as in the laboratory. Author

N73-15146 Defence Research Board, Ottawa (Ontario).
VESTIBULAR INAPTITUDE IN THE ENVIRONMENTS OF FLIGHT AND SPACE
Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1 May 1971 p 92-105 refs Submitted for publication (For availability see N73-15136 06-05)

The vestibular system has become highly adapted to the particular patterns of head movement normally associated with the environment in which it has evolved. But in flight and space, totally different patterns of movement are encountered and serious mis-matching can arise between this sensory system and the new environment. The nature of such inaptitude is examined in terms of current physiological understanding of the otolith organs, semicircular canals, associated central neural mechanisms and the vestibulo-ocular reflex. Applied consequences are considered in the contexts of flight in the atmosphere and in space. Author

N73-15147 Defence Research Board, Ottawa (Ontario).
INTERACTIONS BETWEEN OPTOKINETIC AND VESTIBULO-OCULAR RESPONSES DURING HEAD ROTATION IN VARIOUS PLANES
Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1 May 1971 p 106-117 refs Submitted for publication (For availability see N73-15136 06-05)

Subjects were accelerated on an electronically controlled turntable to a chosen angular velocity which was then maintained constant for three minutes and finally decelerated to a standstill. They either had their heads tilted backwards, or sideways, at 45 deg to the vertical axis of the turntable. Thus they were simultaneously exposed to equal angular velocity stimuli in the skull planes either of yaw and roll, or of yaw and pitch. Measurement of compensatory eye angular velocities in the relevant planes with a movie-photographic technique revealed very poor optokinetic following in the roll plane and hence wide dissociation of oculomotor responses in yaw and roll. In yaw and pitch the components of eye angular velocity were always equal to one another, despite failure (often gross) to reach the numerical value required for visual fixation. Author

N73-15148 Defence Research Board, Ottawa (Ontario).
PREDOMINANT DIRECTION OF GAZE DURING SLOW HEAD ROTATION
S. Mishkin and Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1 May 1971 p 118-125 refs Submitted for publication (For availability see N73-15136 06-05)

When the head is rotated slowly a vestibulo-ocular response acts in a compensatory direction and is usually manifest as ocular nystagmus having a slow compensatory phase interspersed with quick fly-backs in the opposite, or leading, direction. Experiments with human subjects oscillated sinusoidally about a vertical axis have shown that superimposed on this familiar nystagmoid pattern of response there tends to be a slow waveform of change in the average eye position relative to the skull. This waveform had the same frequency as the oscillatory motion of the head but was approximately 90 deg phase advanced with respect to the wave form of head position. This implies that during the sinusoidal head motion the waveform defining averaged eye position relative to the skull was approximately in phase with head angular velocity. It is inferred that the observed waveform of averaged eye displacement probably derived in the main from this vestibular source. Author

N73-15149 Defence Research Board, Ottawa (Ontario).
DEPENDENCE OF VISUAL TRACKING CAPABILITY UPON STIMULUS PREDICTABILITY
Joel A. Michael and Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1 May 1971 p 126-137 refs Submitted for publication (For availability see N73-15136 06-05)

Variable, narrow bandwidths of random noise were used to determine the ability of the human visual tracking system to maintain fixation on moving visual stimuli of various degrees of predictability. The results indicate that there is a continuous relationship between stimulus predictability and tracking capability; the less predictable the stimulus motion the greater the phase shift between stimulus and response at a given frequency. Thus, a predictive component in the system seems to compensate for the relatively poor performance capabilities of the system operating in the unpredictive mode and permits maximally accurate following with the patterns of head and target movements encountered in real life. Author

N73-15150 Defence Research Board, Ottawa (Ontario).
NEURAL REFLECTION OF VESTIBULAR MECHANICS
Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1 May 1971 p 138-151 refs Submitted for publication (For availability see N73-15136 06-05)

The response of canal-dependent units to rotation of a linear acceleration vector without rotation of the animal appears to be relatively uniform and of significant magnitude. This suggests that the latter mode of stimulus may normally generate a meaningful component of information in the central nervous system during angular head movement in vertical planes, since such movement introduces rotation of the gravitational acceleration vector relative to the head. In the zero gravity environment of space flight this component would be absent, thus introducing the potential hazard of discordant information in the central nervous system. Author

N73-15151 Defence Research Board, Ottawa (Ontario).
THE PHYSIOLOGICAL ADAPTATION TO UNILATERAL SEMICIRCULAR CANAL INACTIVATION
Hyman Zuckerman *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1 May 1971 p 152-157 Submitted for publication (For availability see N73-15136 06-05)

Physiological adaptation in the cat of plugging of one horizontal semicircular canal as manifest by the oculomotor response to rotational stimulation is studied. Normal unanaesthetized cats were subjected to a range of oscillatory rotational stimuli, their heads fixed to the rotating platform, with the horizontal canals in the plane of rotation. The same cats were then subjected to similar simuli at intervals after unilateral obstruction of the canal. The main feature of the results was a consistent fall in gain of the overall vestibulo-ocular response by a factor of two in post operative animals. Over the three to four weeks required for functional post operative adaptation of the animal, there was no significant corresponding change in the oculomotor response to vestibular stimulation. Author

N73-15152 Defence Research Board, Ottawa (Ontario).
SOME AVIATION MEDICAL ASPECTS OF FLIGHT CREW FATIGUE
Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1 May 1971 p 158-170 refs Submitted for publication (For availability see N73-15136 06-05)

Quantitative measurements on the time course of decrement in skilled pilot performance for a specific environment as a result of performing that task are reported. Numerical data specify how decrement takes place, and on the basis of results obtained from an adequately representative population it is possible to predict the human operator function and to set time limits for the particular circumstances of the specific conditions. It is shown that subjective changes go hand in hand with objectively demonstrated performance decay. Sensible criteria for rest periods, aircrew accomodations in low noise environments, physiological observations of body responses are all measures to control operator fatigue. G.G.

N73-15153 Defence Research Board, Ottawa (Ontario).
A DYNAMIC MODEL OF THE SEMICIRCULAR CANAL
Robert F. Stevenson *In its* DRB Aviation Med. Res. Unit Rept.,

Vol. 1 May 1971 p 171-174 refs Submitted for publication (For availability see N73-15136 06-05)

A semicircular canal model with a flow visualization chamber was constructed and used to record particle movements in the canal fluid in a simulated response to angular velocity. Refinement of the recording technique allows a frame-by-frame analysis of the fluid, so that the canal velocity profile may be plotted and a comparison made with the flow patterns predicted by Newman. It is shown that the principle utilized in this experiment, maintenance of geometrical similarity and Reynold's number, can be used to advantage in other research problems in physiology. Author

N73-15154 Defence Research Board, Ottawa (Ontario).
FROM LAND TO SPACE IN A GENERATION: AN EVOLUTIONARY CHALLENGE
Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1 May 1971 p 175-198 refs Submitted for publication (For availability see N73-15136 06-05)

Evolutionary barriers associated with human exposure to prolonged zero gravity flight are outlined. It is shown that much of human movement is conducted by accurately time-programmed neural messages and that human adaptation to the space environment requires the release of stored messages and the production of new programs on the basis of on-going feedback from the actual event. G.G.

N73-15155*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ASRDI OXYGEN TECHNOLOGY SURVEY. VOLUME 2: CLEANING REQUIREMENTS, PROCEDURES, AND VERIFICATION TECHNIQUES
H. Bankaitis and Carl F. Schueller 1972 80 p
(NASA-SP-3072) Avail: NTIS HC plus microfiche supplement $3.95 CSCL 06K

The oxygen system cleaning specifications drawn from 23 industrial and government sources are presented along with cleaning processes employed for meeting these specifications, and recommended postcleaning inspection procedures for establishing the cleanliness achieved. Areas of agreement and difference in the specifications, procedures, and inspection are examined. Also, the lack of clarity or specificity will be discussed. This absence of clarity represents potential safety hazards due to misinterpretation. It can result in exorbitant expenditures of time and money in satisfying unnecessary requirements. Author

N73-15156*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
METABOLIC ANALYZER Patent Application
Cortes L. Perry and John A. Rummel, inventors (to NASA) Filed 26 Dec. 1972 35 p
(NASA-Case-MFS-21415-1; US-Patent-Appl-SN-318152) Avail: NTIS HC $3.75 CSCL 06B

An apparatus is reported for the measurement of metabolic rate and breathing dynamics in which inhaled and exhaled breath are sensed by sealed, piston-displacement type spirometers. These spirometers electrically measure the volume of inhaled and exhaled breath. A mass spectrometer analyzes simultaneously for oxygen, carbon dioxide, nitrogen and water vapor. Computation circuits responsive to the outputs of the spirometers, mass spectrometer, temperature, pressure and timing signals compute oxygen consumption, carbon dioxide production, minute volume and respiratory exchange ratio. A selective indicator provides for read-out of these data at predetermined cyclic intervals. NASA

N73-15157# Civil Aeromedical Inst., Oklahoma City, Okla.
A PRELIMINARY STUDY OF MAXIMAL CONTROL FORCE CAPABILITY OF FEMALE PILOTS
Bonne Karim (Okla. Univ., Norman), Karl H. Bergey (Okla. Univ., Norman), Richard F. Chandler, A. Howard Hasbrook, Jerry L. Purswell (Okla. Univ., Norman), and Clyde C. Snow Jul. 1972 19 p refs
(FAA-AM-72-27) Avail: NTIS HC $3.00

The growing number of female pilots entering the field of civil aviation has suggested the need for a study of the maximum allowable forces which should be specified for operating aircraft controls. Therefore, a study was made of the maximal voluntary forces which a sample of 25 female pilots could exert on each flight control. Further, the percent of maximal strength versus endurance relationship reported by other investigators was studied for this population in operating each control. The percent of maximal strength versus endurance relationship was established and compared with the results of other investigators. The results obtained indicate a need for further study of the subject in simulated and actual flight. Author

N73-15158*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CARDIAC R-WAVE DETECTOR WITH AUTOMATIC SENSITIVITY CONTROL
Vernon D. Gebben and John A. Webb, Jr. Washington Jan. 1973 21 p refs
(NASA-TN-D-7152; E-7216) Avail: NTIS HC $3.00 CSCL 06B

An electronic circuit that automatically changes its sensitivity was developed for detecting the bioelectric signal resulting from activation of the heart's ventricles. Regulation of sensitivity was accomplished with two feedback channels that maintain the sensitivity level between an upper and a lower limit. These limits are proportional to the R-wave amplitude. Tests on an experimental circuit demonstrated a capability to reject unwanted signal noise, illustrated difficulties encountered without sensitivity control, and presented closed loop transients which occurred for step changes in R-wave amplitude. Author

N73-15159*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
THE DEVELOPMENT OF A NON-CRYOGENIC NITROGEN/OXYGEN SUPPLY SYSTEM
B. M. Greenough 1 Dec. 1972 183 p refs
(Contract NAS9-10405)
(NASA-CR-128688; MSC-07384) Avail: NTIS HC $11.25 CSCL 06K

Development of the hydrazine/water electrolysis process in a manned spacecraft to provide metabolic oxygen and both oxygen and nitrogen for cabin leakage makeup was studied. Electrode development efforts were directed to stability, achieved with catalyst additives and improved processing techniques, and a higher hydrazine conversion efficiency, achieved by reducing catalyst loading on the cathodes. Extensive testing of the one-man breadboard N2/02 system provided complete characterization of cabin atmosphere control aspects. A detailed design of a prototype modular N2/02 unit was conducted. The contact heat exchanger which is an integral component of this design was fabricated and sucessfully design-verification tested. Author

N73-15160*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
WATER ELECTROLYSIS SYSTEM REFURBISHMENT AND TESTING
B. M. Greenough 1 Dec. 1972 181 p refs
(Contract NAS9-11848)
(NASA-CR-128687; MSC-07383) Avail: NTIS HC $11.25 CSCL 06K

The electrolytic oxygen generator for the back-up water electrolysis system in a 90-day manned test was refurbished, improved and subjected to a 182-day bench test. The performance of the system during the test demonstrated the soundness of the basic electrolysis concept, the high development status of the automatic controls which allowed completely hands-off operation, and the capability for orbital operation. Some design improvements are indicated. Author

N73-15161*# Advanced Rocket Technology, Irvine, Calif.
INVESTIGATION OF BIOWASTE RESISTOJETS FOR SPACE STATION APPLICATION
Carl R. Halbach, Russell J. Page, Owen J. McCaughey, and Robert A. Short Jul. 1972 158 p refs
(Contract NAS1-10934)
(NASA-CR-112159) Avail: NTIS HC $10.00 CSCL 06I

The feasibility of using electrically conducting ceramics to heat biowaste propellants to 2000 K in resistojet thrustors was demonstrated. These thrustors are being developed for use on the space station. Among the candidate ceramic heater materials, zirconia and thoria are chemically resistant to the biopropellants,

and they are also sufficiently conductive at high temperatures to make them suitable for the heater elements in these thrustors. A proof of concept thrustor design is presented, incorporating a multiple passage cylindrical heater made of zirconia ceramic which is capable of operating at 2000 K wall temperature with CO2 and H2O biopropellants. For the 25 mlb size thrustor, specific impulses of 200 seconds for CO2 and 275 seconds for H2O biopropellants are predicted. Author

N73-15162*# Space Age Control, Inc., Palmdale, Calif.
HIGH PRESSURE SPACE SUIT GLOVE
2 Jan. 1972 15 p ref
(Contract NAS2-7009)
(NASA-CR-114532; SAC-100218) Avail: NTIS HC $3.00 CSCL 06Q

A description is given of a prototype full pressure glove that will allow maximum dexterity, tactility and stability at an operating pressure of psi. Author

N73-15163# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. fuer Flugmedizin.
OXYGEN THERAPY. OBSERVATIONS ON THE BEHAVIOR OF ENZYME ACTIVITIES IN PLASMA AFTER BREATHING OXYGEN AT HIGH PRESSURE [ZUR SAUERSTOFF-THERAPIE. BEOBACHTUNGEN UEBER DAS VERHALTEN EINIGER ENZYMAKTIVITAETEN IM PLASMA NACH REINER SAUERSTOFFATMUNG IM UEBERDRUCK]
Helge Paulmann Aug. 1971 67 p refs In GERMAN; ENGLISH summary
(DLR-FB-71-96) Avail: NTIS HC $5.50; DFVLR, Porz, West Ger. 17,60 DM

The behavior of enzyme activities in blood plasma was examined to establish the pulmonary cellular damage of young men exposed to oxygen at high pressure. A correlation was found between the extent of the stress reaction and the stress intensity. Pulmonary damage caused by oxygen poisoning could not be determined by the enzyme diagnosis. Author (ESRO)

N73-15164# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Abteilung Mechanische Hoehenwirkung und Caissonforschung.
PRESSURE GRADIENT MEASUREMENTS IN THE BODIES OF ANIMALS WITH AIR BLAST INJURIES [DRUCKVER-LAUFSMESSUNGEN IM TIERKOERPER BEI LUFTSTOSS-VERLETZUNGEN]
Otto Wuensche and Gerhard Scheel E Jul. 1971 26 p refs In GERMAN; ENGLISH summary
(DLR-FB-71-72) Avail: NTIS HC $3.50; DFVLR, Porz, West Ger. 9 DM

Pressure pulse experiments were conducted and intracorporeal pressures were measured in miniature pigs and albino rats using a previously validated technique and specially selected pressure probes. These were localized for the miniature pigs in the esophagus, the rectum, and in the musculature of the back and the thigh, and for the albino rats, in the rectum. The clinical symptoms caused by pressure pulse and the detected morphological findings, are demonstrated and verified by macro- and microscopical photographs. The variations in the results of these experiments are discussed. Author (ESRO)

N73-15165# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
TARGET ACQUISITION FOR PICTURE TRANSMISSION USING A TV SYSTEM [ZIELENTDECKUNG BEI DER BILDUEBERTRAGUNG DURCH EIN TV-SYSTEM]
Udo Miller Sep. 1972 26 p refs In GERMAN Presented at the 5th DGLR Ann. Meeting, Berlin, 4-6 Oct. 1972
(MBB-UFE-892-72-O; DGLR-Paper-72-099) Avail: NTIS HC $3.50

The target acquisition time was measured for test subjects observing a TV image, as a function of transmission bandwidth (of the video signal), the contrast, and several image enhancement possibilities. The results show that target acquisition can be improved, especially for bad meteorological conditions (fog, mist, rain), by contrast variation, contrast harmonization using a masking image, and noise filtering. Author (ESRO)

N73-15166# Defence Research Information Centre, Orpington (England).
ASSESSMENT OF THERMAL INSULATION PROPERTIES OF CLOTHING
V. I. Vankelevich Nov. 1972 9 p refs Transl. into ENGLISH from Tekhnol. Legkoj. Prom. (Kiev), vol. 1, 1972, p 88-92
(DRIC-Trans-2921) Avail: NTIS HC $3.00

To assess the degree of difference between conditions for testing thermal insulation properties of materials in models and conditions for testing air-penetrable clothing in wind, as well as the authenticity of the results, an examination is made of the physical processes governing the transfer of heat through air-penetrable clothing in wind. It is found that in wind, filtration of air takes place through the material of air-penetrable clothing as a result of the difference in dynamic pressures on the surface of the clothing. When there is an air layer under the material, air filtration through the clothing and the associated heat transfer is significantly greater than when the clothing is tight fitting.
Author (ESRO)

N73-15167# Informatics, Inc., Rockville, Md.
SOVIET BIOCYBERNETICS BIBLIOGRAPHY, JANUARY - MAY 1972
Stuart G. Hibben Jul. 1972 36 p refs
(Contract F44620-72-C-0053; ARPA Order 1622-3)
(AD-750129; AFOSR-72-1961TR) Avail: NTIS CSCL 06/4

A bibliographic listing is given of all material relating to Soviet biocybernetic studies, received in the January - May 1972 interval. The report represents the optional fifth subject for the May monthly report, issued under separate cover. Author (GRA)

N73-15168# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE QUESTION OF GROUND TRAINING OF FLYING PERSONNEL
V. Ya. Gilinskii 28 Jul. 1972 7 p Transl. into ENGLISH from the publ. "Moskovskoye Fiziologicheskoye Obshchestvo Sektsiya Aviatsionnoy i Kosmicheskoy Meditsiny, Aviakosmicheskaya Meditsina, Trudy" Moscow, 1967 p 226-227
(AD-749621; FTD-MT-24-280-72) Avail: NTIS CSCL 05/9

The article confirms the validity of that point of view according to which ground training should be provided for in the programs of flight training, retraining, and maintenance of flying skill.
Author (GRA)

N73-15169# Naval Medical Research Inst., Bethesda, Md.
A STUDY OF A CUTANEOUS CODE APPLIED TO THE COMMUNICATION NEEDS OF THE WORKING DIVER
Medical Research Progress Report
Joseph Diachenko 15 Aug. 1972 24 p refs
(AD-750268; PR-2) Avail: NTIS CSCL 05/10

As an initial study into the applicability of cutaneous communication for divers, a series of sixteen discrete, left-right (L-R) vibrotactile stimulus patterns was delivered to the lower abdomen of six divers whose task it was to correctly identify the spatio-temporal sequency of each pattern. Correlation analysis of the results showed that older subjects made significantly more errors, and complex code patterns containing the L-R changes in direction contributed significantly to subject error. However, the overall design of L-R patterns was found to be basically satisfactory as a framework on which to build an optimal cutaneous code. Further development of code design and hardware are suggested. Author (GRA)

N73-15170# Naval Training Equipment Center, Orlando, Fla.
AN EVALUATION OF THE TRAINING EFFECTIVENESS OF DEVICE 2F90, TA-4J OPERATIONAL FLIGHT TRAINER. PART 1: THE B STAGE Final Report
Leonard E. Ryan, Joseph A. Puig, Gene S. Micheli, and James C. Clarke Aug. 1972 59 p refs
(AD-750248; NAVTRAEQUIPCEN-IH-207-PT-1) Avail: NTIS CSCL 05/9

The training effectiveness of the TA-4J advanced jet trainer (Device 2F90) was evaluated by measuring transfer of training from the trainer to the operational situation. Comparisons were made among three experimental and a control group (which received the normal syllabus training). Of the experimental groups, one received training in flight, another group only in the trainer,

and the third received only academic training on related principles of the basic instrument portion of the syllabus. Following training, all groups were given a checkride in the aircraft. The relative benefits of the different types of training were evaluated to determine the effectiveness of the trainer in training advanced naval aviation students in the B stage (Basic Instruments) of the NAVJIT (Naval Jet Instrument Trainer) syllabus for the TA-4J aircraft. The study demonstrated that 4.4 hours of aircraft flight time per student could be saved by substituting trainer time for aircraft time in the B stage; a significant cost savings when considering the 450 students that are processed through the school annually. Author (GRA)

N73-15171# Washington Univ., St. Louis, Mo.
THE EFFECT OF FATIGUE ON VISUAL SEARCH ACTIVITY Final Report
John A. Stern 1 Jul. 1972 42 p refs
(Contract DA-49-193-MD-2715)
(AD-750097) Avail: NTIS CSCL 05/10

The report reviews work on the development of recording techniques for obtaining outputs from the manipulanda of helicopters (UH-1D) and automobiles as well as techniques for processing such data. The majority of the report deals with the recording and utilization of measures of visual search activity for the assessment of pilot performance as a function of such variables as level of training, time on task, and sleep deprivation. Necessary hardware for electrooculographic recording of visual search activity was developed, as well as computer techniques for abstracting relevant information from these records. Two published studies utilizing these procedures are included. The report details some further development of the application of analytic programs to the evaluation of reading activity.
Author (GRA)

N73-15172# Army Tank-Automotive Command, Warren, Mich.
THE EFFECTS OF VIBRATION ON VISION AS APPLIED TO MILITARY VEHICLES
Richard A. Lee 1972 16 p refs
(AD-750345) Avail: NTIS CSCL 06/19

The objective of the study was to quantify the loss of visual acuity during whole-body vibration of a seated human. To obtain accurate measurements of eye motion during whole-body vibration, a target was set up in front of a vibration simulator.
GRA

N73-15173# Frankford Arsenal, Philadelphia, Pa.
SPECTRAL DEFICITS IN VISUAL ACUITY DUE TO LASER IRRADIATION
Harry Zwick, R. Bruce Bedell, and Kenneth Bloom 1972 12 p refs
(AD-750394) Avail: NTIS CSCL 06/18

The increased use of lasers and laser devices has made it essential to determine the potential kinds of visual deficits associated with accidental laser exposure. Maximal visual acuity and normal color vision are closely associated with foveal receptor function. When the fovea is destroyed by laser irradiation, severe and permanent losses in visual acuity ensue. The purpose of the study was the determination of permanent photopic or color deficits in animal subjects following foveal injury produced by ruby laser irradiation. GRA

N73-15174# Human Factors Research, Inc., Goleta, Calif.
ACTIVE SONAR TARGET DETECTION AND REPORTING: PERCEIVED CONSEQUENCES AND THEIR EFFECTS ON PERFORMANCE
C. Dennis Wylie and Robert R. Mackie Jun. 1972 176 p refs
(Contract N00014-71-C-0257; NR Proj. 196-104)
(AD-750761; Rept-1721-1) Avail: NTIS CSCL 05/9

The objective of the research was to examine the effects of operational situations upon sonar operator's contact reporting behavior. An attitude survey involving fleet sonar operators and destroyer officers was conducted to determine the subjective values of five decision-making variables with respect to seventeen scenarios depicting peacetime and wartime tactical situations. It was found that sonar contact reporting thresholds were principally determined by the perceived consequences of missed contacts and of delay in contact reporting. It was also found that the assessments of false contact consequences were very inconsistent, unlike the judgments with respect to the other decision variables. The second phase of the research consisted of a sonar detection experiment, in which the influence of the variable command attention on performance was measured to give an objective evaluation of the effects of psychological variables.
Author (GRA)

N73-15175# Navy Experimental Diving Unit, Washington, D.C.
DIVER ANTHROPOMETRICS Final Report
Hugh T. Beatty and Thomas E. Berghage 1 Jun. 1972 150 p refs
(AD-748627; NEDU-RR-10-72) Avail: NTIS CSCL 05/5

To aid the design engineer in the development of future U. S. Navy diving systems and equipment a comprehensive anthropometric study was undertaken. Fifty-four anthropometric measures, two pulmonary function measures, and three derived body measures were obtained on 100, 41, and 100 U. S. Navy divers respectively. Descriptive statistics and measures of interrelationship are given for each measured and derived variable. The minimum number of anthropometric variables needed was determined by factor analysis. The measures obtained on the U. S. Navy divers were compared with anthropometric data available for the male aviation populations. Author

N73-15092* Ohio State Univ., Columbus.
BAROMETRIC PRESSURE
Charles E. Billings *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 1-34 (For availability see N73-15091 06-04)
CSCL 06S

N73-15093* Ohio State Univ., Columbus.
ATMOSPHERE
Charles E. Billings *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 35-63 refs (For availability see N73-15091 06-04)
CSCL 06S

N73-15094* AiResearch Mfg. Co., Los Angeles, Calif.
TEMPERATURE
P. J. Berenson and W. G. Robertson *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 65-148 refs (For availability see N73-15091 06-04)
CSCL 06S

N73-15095* Waterloo Univ. (Ontario).
SUSTAINED LINEAR ACCELERATION
T. Morris Fraser *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 149-190 refs (For availability see N73-15091 06-04)
CSCL 06S

N73-15096* Waterloo Univ. (Ontario).
ROTARY ACCELERATION
T. Morris Fraser *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 191-219 refs (For availability see N73-15091 06-04)
CSCL 06S

N73-15097* Michigan Univ., Ann Arbor.
IMPACT
Richard G. Snyder *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 221-295 refs (For availability see N73-15091 06-04)
CSCL 06S

N73-15098* Litton Systems, Inc., Beverly Hills, Calif.
VIBRATION
Richard J. Hornick *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 297-348 refs (For availability see N73-15091 06-04)
CSCL 06S

N73-15099* National Aeronautics and Space Administration, Washington, D.C.
WEIGHTLESSNESS
Charles A. Berry *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 349-415 refs (For availability see N73-15091

06-04)
CSCL 06S

N73-15100* New England Deaconess Hospital, Boston, Mass.
IONIZING RADIATION
Shields Warren and Douglas Grahn (ANL) *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 417-454 refs (For availability see N73-15091 06-04)
CSCL 06R

N73-15106* Aberdeen Proving Ground, Md.
NOISE AND BLAST
David C. Hodge and Georges R. Garinther *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 693-750 refs (For availability see N73-15091 06-04)
CSCL 06S

N73-15107* Massachusetts Inst. of Tech., Cambridge.
HUMAN CONTROL CAPABILITIES
Laurence Retman Young *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 751-806 refs (For availability see N73-15091 06-04)
CSCL 05E

N73-15108* National Aeronautics and Space Administration, Washington, D.C.
ATMOSPHERE CONTROL
Walton L. Jones and A. L. Ingelfinger *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 807-845 refs (For availability see N73-15091 06-04)
CSCL 06K

N73-15109* Webb Associates, Yellow Springs, Ohio.
WORK, HEAT, AND OXYGEN COST
Paul Webb *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 847-879 refs (For availability see N73-15091 06-04)
CSCL 05E

N73-15110* Indiana Univ., Bloomington. School of Medicine.
COMBINED ENVIRONMENTAL STRESSES
Raymond H. Murray and Michael McCally (AMRL) *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 881-914 refs (For availability see N73-15091 06-04)
CSCL 06S

N73-15111* National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE VEHICLE WATER-WASTE MANAGEMENT
Joseph N. Pecoraro *In* BioTechnol., Inc. Bioastronaut. Data Book, 2d Ed. 1973 p 915-930 refs (For availability see N73-15091 06-04)
CSCL 06I

06 CHEMISTRY

Includes chemical analysis and identification (e.g. spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N73-15176# Defence Research Establishment Valcartier (Quebec).
THE ULTRAVIOLET FLASH PHOTOLYSIS OF OZONE AND THE REACTION OF O(D-1) WITH H2O
C. J. Fortin, D. R. Snelling, and A. Tardif Oct. 1972 35 p refs
(DREV-TN-2026/72) Avail: NTIS HC $3.75

The decomposition of gas mixtures containing ozone was studied following a short duration ultraviolet light pulse. From an analysis of the ozone decomposition curves for O3:N2 and O3:N2:H2O mixtures, it is shown that the relative rate of O(1 D) reaction with H2O and N2 is k sub H2O/k sub N2 = 3.5 + or - 1.5. It is shown that less than 6 percent of the oxygen, formed directly by photolysis, is in the (1 Sigma g +) state. The water catalyzed decomposition of ozone is also discussed. Author

N73-15177# Bhabha Atomic Research Centre, Bombay (India).
ESTIMATION OF TRACES OF GASES IN METALS AND ALLOYS BY VACUUM FUSION TECHNIQUE
Ch. Venkatwswarlu 1972 28 p refs
(BARC-590) Avail: AEC Depository Libraries

Hydrogen, oxygen, and nitrogen are common impurities in virtually all metals and alloys. The physical, mechanical, and electrical properties of the host metal are often influenced to a significant extent by these interstitial impurities. Of the various methods reported in literature, the vacuum fusion technique seems to be the most popular in the field for determination of gases in metals. The principle, apparatus, vocabulary, reaction media, general procedure, precision and accuracy, recent trends, and future scope for development in the vacuum fusion technique are reviewed (70 references). Author (NSA)

N73-15178# Defence Research Information Centre, Orpington (England).
SYNTHESIS OF 5-ETHYLPICOLINE ACID
A. N. Kost, P. B. Terentier et al Nov. 1972 8 p refs Transl. into ENGLISH from Vestn. Mosk. Univ. Ser. Khim. (Moscow), vol. 19, no. 6, 1964 p 427-430
(DRIC-Trans-2951; BR-30317) Avail: NTIS HC $3.00

The applicability of different methods to the conversion of the a-methyl group of pyridine into the carboxyl group was checked. As the model substance 2-methyl 5-ethyl pyridine was chosen and was coverted into 5-ethyl picoline acid by nine different methods using four means of oxidation. Author (ESRO)

N73-15179# National Physical Lab., Teddington (England). Div. of Chemical Standards.
VAPOUR PRESSURE EQUATIONS
D. Ambrose Nov. 1972 22 p refs
(NPL-Chem-19) Avail: NTIS HC $3.25

An account is given of the ways in which the relationship between temperature and vapor pressures of single component liquids may be expressed mathematically. Chebyshev polynomials and vapor-pressure measurement was adapted and amplified. The representation of the measurement results is discussed, though reference is made to methods of estimating vapor pressure. Author (ESRO)

N73-15180# Kentucky Research Foundation, Lexington.
STUDIES OF ELECTROCHEMICAL PROCESSES Annual Technical Report No. 3
H. H. Bauer, E. B. Bradley, E. V. Brown, J. E. Funk, K. Niedenzu, P. G. Sears, and J. R. Wasson Ft. Monmouth, N. J. ECOM Oct. 1972 77 p refs
(Contract DAAB07-69-C-0366)
(AD-750079; ECOM-0366-3; ATR-3) Avail: NTIS CSCL 07/4

The design and construction of electrochemical power sources continues to be something of an empirical art. Non-aqueous electrolytes and solid electrodes have been studied. The behavior of solid electrodes was examined with emphasis on the specific characteristics of the electrode material in determining the nature of the procedure of electrode reactions, on the nature of films formed at solid electrodes, and on the structure of the electrical double-layer. Non-aqueous solvents of potential utility for electrolyte systems were studied from the viewpoints of efficacy as ionizing solvents, useful temperature range, and synergistic effects of mixed solvents. Studies of electrode processes in non-aqueous solvents were also carried out. GRA

N73-15561 Joint Publications Research Service, Arlington, Va.
ON THE QUESTION OF THE INTERACTION MECHANISM OF TITANIUM CHLORIDE WITH MAGNESIUM
V. E. Geger, I. M. Cheprasov, V. N. Dmitriyev, Ye. I. Fedotov, and N. Sh. Gafurova *In its* Selected Transl. in Met. 16 Jan. 1973 p 9-15 refs (For availability see N73-15559 06-17)

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N73-15181 British Broadcasting Corp., Kingswood (England). Research Dept.
TELEVISION SYSTEM 1: A PROPOSED SPECIFICATION FOR GROUP DELAY AT HIGH VIDEO FREQUENCIES
R. W. King and A. Brown 1972 8 p refs
(BBC-1972/39) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The specification described is based on the results of subjective tests in which particularly critical still pictures were subjected to group delay variations at frequencies above the color subcarrier. Large variations can be tolerated towards the top of the band: there is little impairment when the delay rises from nearly zero at 4.4 MHz to 1.1 microns at 5.5 MHz. It is shown that the 10-T chrominance pulse can be used for testing this type of distortion, and a template for system evaluation is described.
Author

N73-15182 British Broadcasting Corp., Kingswood (England). Research Dept.
THE CONTRAST HANDLING REQUIREMENTS OF A COLOUR TELEVISION DISPLAY
R. N. Robinson 1972 10 p refs
(BBC-1972/37) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Domestic television viewing conditions are surveyed. These conditions were reproduced in a laboratory in order to determine the contrast range of the eye. The dependence of the contrast range visible to the eye upon ambient illumination and upon the form and brightness of the displayed picture were investigated; these results are then interpreted in terms of the contrast range available form a practical display tube under simular conditions. It is found that under normal viewing conditions the visible contrast range of a television picture is severely limited by flare within the display tube and ambient light reflected from the tube face. A reduction of the reflectance of the tube face to approximately 28 percent of its present value is required for good reproduction of the luminance range visible under typical viewing conditions.
Author

N73-15183# Groupe de Recherches Ionospheriques, Paris (France).
EXPLICIT DETERMINATION OF THE DIRECTION OF STATIONARY PHASE IN THE PROPAGATION OF AN ELECTROMAGNETIC WAVE FROM ONE ABSORBENT MEDIUM TO ANOTHER
B. Roehner Jun. 1972 21 p ref Transl. into ENGLISH from "Determination Explicite de la Direction de Phase Stationnaire lors de la Transmission d'une onde Electromagnetique d'un Milieu Isotrope Absorbant a un Autre" Paris, Groupe de Recherches Ionospheriques Rept. GRI/TP/110 In ENGLISH and FRENCH
(GRI/TP/110) Avail: NTIS HC $3.25

The direction of stationary phase in an absorbent medium is applied to a ray propagated through three successive homogeneous isotropic media, the last two of which are absorbent. Analytic expressions are derived for the direction of stationary phase as a function of the characteristics of the successive media. These analytic results are exploited numerically to show to what extent the approximation of quasi-transparent media remains valid, and to study highly absorbent media.
Author

N73-15184# Communications Research Centre, Ottawa (Ontario). Communication Systems Directorate.
AN EXPERIMENTAL LOOK AT THE USE OF RADAR TO MEASURE SNOW AND ICE DEPTHS
G. O. Venier and F. R. Cross Nov. 1972 32 p
(CRC-TN-646) Avail: NTIS HC $3.75

The feasibility of using a high resolution FM radar at X-band for measuring the depth of snow and the thickness of fresh water ice was investigated in a series of laboratory and field measurements. A resolution of less than one foot was achieved with the simple radar assembled for the measurements, and it should be possible to reduce this to a few inches in a carefully designed radar. Although only a limited range of snow and ice conditions were available for measurement, the results indicated that accurate depth measurements can be carried out with a radar of this type. Some of the parameters of a practical airborne radar system for measuring snow and ice depths are discussed.
Author

N73-15185# Academy of Sciences (USSR), Moscow.
LUNAR SURFACE LAYER DENSITY FROM DATA OF THE RADAR MEASUREMENTS ON SPACECRAFT
N. N. Kroupenio 1971 23 p refs In ENGLISH and RUSSIAN
(D-17) Avail: NTIS HC $3.25

From data obtained on the Luna 11, and Luna 12 experiments, the effective dielectric permeability of the lunar surface was determined. Using the Kroticov equation, the density is determined from the dielectric permeability. The results of density measurements from satellites, and automatic stations are tabulated.
F.O.S.

N73-15186# Royal Inst. of Tech., Stockholm (Sweden).
UNIFILAR SOURCES AND SOURCE APPROXIMATION Ph.D. Thesis
Thomas Ericson 1972 11 p refs
Avail: NTIS HC $3.00

Two classes of unifilar probabilistic sources in modern communication theory, namely linear sources and renewal sources, are characterized by their sets of high probability sequences. Approximative parameters of the models are chosen in accordance with the maximum likelihood principle so that the sets of high probability sequences associated with the real sources will essentially constitute subsets of those of the models.
G.G.

N73-15187# Research Inst. of National Defence, Stockholm (Sweden).
ACTIVE JAMMING OF SURVEILLANCE RADAR STATIONS
S. A. Vakin and L. N. Sjustov Apr. 1971 60 p refs Transl. into SWEDISH from Russian Rept. FOA-337 In SWEDISH
(FOA-3-C-3645-66; FOA-337) Avail: NTIS HC $5.00

Surveillance radar stations work mostly with pulse drift methods. Outlined are the various characteristics that jamming with amplitude modulation, phase modulation, and frequency modulation by airborne electronics produce.
Transl. by G.G.

N73-15188# Research Inst. of National Defence, Stockholm (Sweden).
ARTIFICIAL TARGETS
S. A. Vakin and L. N. Sjustov May 1971 29 p refs Transl. into SWEDISH from Russian Rept. FOA-337 In SWEDISH
(FOA-3-C-3649-66; FOA-337) Avail: NTIS HC $3.50

Jamming of control data transmission sequences to aircraft or missiles and garbling of voice communication between ground and aircraft are achieved by pulse amplitude modulation and irregular pulse time interruptions to telemetry systems. Mathematical models and graphic drawings of these electronic countermeasures are included.
Transl. by G.G.

N73-15189# Research Inst. of National Defence, Stockholm (Sweden).
ELECTRONIC COUNTERMEASURES BASED ON CHANGES IN THE ELECTRICAL PROPERTIES OF THE WAVE PROPAGATION MEDIUM AND METHODS FOR REDUCING THE RADAR TARGET
S. A. Vakin and L. N. Sjustov May 1971 31 p refs Transl. into SWEDISH from Russian Rept. FOA-337 In SWEDISH
(FOA-3-C-3652-66; FOA-337) Avail: NTIS HC $3.75

The absorption, reflection, or scattering of electromagnetic waves by plasma media as countermeasures to radar detection are considered. Evaluated are cesium and sodium ionization clouds, as well as high atmospheric nuclear explosion effects on radar signal transmission.
Transl. by G.G.

N73-15190*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
MALFUNCTION OF TELEVISION CAMERA MONITOR ON COMMAND MODULE Apollo 16 Mission Anomaly No. 11

Oct. 1972 6 p
(NASA-TM-X-68930; MSC-07489) Avail: NTIS HC$3.00 CSCL 09F

The command module television camera monitor exhibited loss of horizontal synchronization during the initial usage. This condition cleared and performance of the monitor was normal until the press conference telecast during the transearth coast phase. At that time, the monitor had the same horizontal synchronization problem reported during the initial usage. The horizontal hold control adjustment would not correct the condition. The monitor was turned off for approximately 5 minutes, then turned back on, after which the monitor's picture was normal. The loss of horizontal synchronization was most likely caused by either an intermittent condition in the precision voltage regulator circuit assembly in the low voltage power supply, or the shift of the stable range of the horizontal potentiometer setting when warming up after turn-on. Author

N73-15191# Chicago Univ., Ill. Lab. for Atmospheric Probing.
A TWO DIMENSIONAL EVALUATION OF A DUAL WAVE-LENGTH RADAR HAIL DETECTOR
R. E. Carbone 1 Apr. 1972 54 p refs Prepared in cooperation with Ill. Inst. of Tech.
(Grant NSF C-46-0)
(TR-25) Avail: NTIS HC $4.75

The dual wavelength hail detector is evaluated for the effects of background rainfall rate and graeients thereof, range dependence and hail shaft size, pattern recognition, and beam misalignment. Averaging over finite beam which degrades hail detectability with increasing range and/or decreasing size of a hail shaft. False alarms due solely to gradients of rainfall rate within the pulse volumes are possible, particularly when the beams are misaligned and they are near the periphery of a storm or in a region of generally weak echo. Pattern recognition is shown to play an important role in the detection of hail. The pattern commonly appears as an arc along the trailing edge of a hail shaft when the nominal beam width is small compared to the shaft's dimensions and as a trailing dash when the beam width is comparable to or larger than the shaft's dimensions. Author

N73-15192*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A STEP IN TIME: CHANGES IN STANDARD-FREQUENCY AND TIME-SIGNAL BROADCASTS, 1 JANUARY 1972
A. R. Chi and H. S. Fosque Washington Jan. 1973 35 p refs
(NASA-TN-D-7065; G-1058) Avail: NTIS HC $3.00 CSCL 17B

An improved coordinated universal time (UTC) system has been adopted by the International Radio Consultative Committee. It was implemented internationally by the standard-frequency and time-broadcast stations on 1 Jan. 1972. The new UTC system eliminates the frequency offset of 300 parts in 10 to the 10th power between the old UTC and atomic time, thus making the broadcast time interval (the UTC second) constant and defined by the resonant frequency of cesium atoms. The new time scale is kept in synchronism with the rotation of the Earth within plus or minus 0.7 s by step-time adjustments of exactly 1 s, when needed. A time code has been added to the disseminated time signals to permit universal time to be obtained from the broadcasts to the nearest 0.1 s for users requiring such precision. The texts of the International Radio Consultative Committee recommendation and report to implement the new UTC system are given. The coding formats used by various standard time broadcast services to transmit the difference between the universal time (UT1) and the UTC are also given. For users' convenience, worldwide primary VLF and HF transmissions stations, frequencies, and schedules of time emissions are also included. Actual time-step adjustments made by various stations on 1 Jan. 1972, are provided for future reference. Author

N73-15193# Lockheed Missiles and Space Co., Palo Alto, Calif.
COHERENT SYSTEMS
D. S. Kontorov and Iu. S. Golubev-Novozhilov [1972] 25 p Transl. into ENGLISH from the book "Vvedenie v Radiolokatsionnuiu Sistemotekhniku" Moscow, Sovetskoe Radio, 1971 p 221-256
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The optimal design of a coherent radar system is described in terms of selection and utilization of segments of the antenna and the spectrum. The fundamental characteristics of a coherent system are examined along with the characteristics of signal detection with intrachannel phase errors in idealized processing methods. The peculiarities of coherent systems are discussed. F.O.S.

N73-15194*# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
CURRENT DISTRIBUTION ON AN INFINITE TUBULAR ANTENNA IN A COLD COLLISIONAL MAGNETOPLASMA
B. Bhat May 1972 74 p refs
(Grant NGR-22-007-056; Contracts N00014-67-A-0298-0005; N00014-67-A-0298-0006; N00014-67-A-0298-0008; Grant NSF GK-24105; NR Proj. 371-016)
(NASA-CR-130297; AD-744045; TR-634) Avail: NTIS HC $5.75 CSCL 17B

An infinite tubular antenna immersed in an unbounded cold collisional magnetoplasma is treated as a boundary value problem. The d.c. magnetic field is assumed parallel to the antenna. The antenna is driven by a delta function generator at $z = 0$. It is shown that in the presence of collisions, the antenna is thin compared with all the characteristic wavelengths in the medium. An expression is derived for the total axial component of the current on the antenna and numerical solutions are obtained over a wide range of plasma parameters including the refractive index resonance regions of the magnetoionic medium. The effect of collisions on the current distribution along the antenna operating in each of the resonant and non-resonant regions is also studied. Author

N73-15195*# Scientific Translation Service, Santa Barbara, Calif.
DISCUSSION AND PLANNING OF A SYSTEM FOR A TELEVISION TRANSMITTING SATELLITE
H. Billig Washington NASA Jan. 1973 21 p refs Transl. into ENGLISH of DGN, Porz-Wahn, West Germany, report 72-051 "Systemauslegung und Planung fuer einen Fernsehrundfunksatelliten" Oct. 1972 18 p
(Contract NASw-2483)
(NASA-TT-F-14660; DGW-72-051) Avail: NTIS HC$3.25 CSCL 09F

The requirements of the Federal Post Office for more television programs in the forseeable future can be met by a satellite television system. This is particularly attractive in combination with local cable systems. Author

N73-15196*# Scientific Translation Service, Santa Barbara, Calif.
DIRECT TELEVISION RECEPTION VIA SATELLITES
A. H. Schendel and F. W. Bodemann NASA Washington Jan. 1973 17 p refs Transl. into ENGLISH of West German conference paper 72-050 "Fernsehdirektempfang ueber Satelliten" Oct. 1972 16 p Presented at 5th Ann. Meeting of the DGLR, Berlin, 5 Oct. 1972
(Contract NASw-2483)
(NASA-TT-F-14659; Paper-72-050) Avail: NTIS HC$3.00 CSCL 09F

Technical and economic factors involved in satellite television reception are reported. One such satellite could provide nearly 100% coverage of the German Federal Republic. Conditions for development of such a satellite in the Federal Republic are good. Because of the complexity and cost of such a project, the extent to which it can be carried out is unknown. Such satellites are gaining in importance for the developing nations, and previous work has provided a good starting point for international cooperation. Author

N73-15197*# North American Rockwell Corp., Downey, Calif. Space Div.
WEST COAST RFI SURVEY, VOLUME 1, VOLUME 2 APPENDIX E, VOLUME 3 APPENDIX F, VOLUME 4 APPENDIX G, AND VOLUME 5 APPENDIX H Final Report, 7 Dec. 1971 - 15 Dec. 1972
W. F. Deutsch 21 Dec. 1972 1266 p
(Contract NAS5-22009)
(NASA-CR-130146; SD-72-SA-0100-Vol-1; SD-72-SA-0100-

Vol-2-App-E; SD-72-SA-0100-Vol-3-App-F; SD-72-SA-0100-Vol-4-App-G; SD-72-SA-0100-Vol-5-App-H) Avail: NTIS HC $65.30 CSCL 17B

Activities and data reported cover experimental design, mechanization onboard the aircraft, survey operations, quick look and automated data reduction, and a qualitative comparison of survey data with predicted values for the radio frequency survey. The survey was designed to measure amplitude, frequency and time of occurrence of terrestrial emissions in the VHF band during overflights of heavily populated metropolitan areas located on the Pacific Coast of the Continental United States by sensing and recording equipment installed in jet aircraft. Author

N73-15198# Elliott-Automation Space and Advanced Military Systems, Ltd., Camberley (England).
SIDE-LOOKING RADAR SYSTEMS AND THEIR POTENTIAL APPLICATION TO EARTH RESOURCE SURVEYS. VOLUME 7: BIBLIOGRAPHY
R. J. Haslam Aug. 1972 110 p refs
(Contract ESTEC-1537/71-EL)
(ESRO-CR(P)-142-Vol-7; Ref-5795-Vol-7) Avail: NTIS HC $7.50

References relevant to side-looking radar as a remote sensor for earth resources are listed. The following subject areas are included: agriculture, forestry, geography, geology, hydrology, oceanography, data processing, terrain analysis, and photointerpretation. Author and subject indexes are given. The references are also stored on magnetic tape. Author (ESRO)

N73-15199# Siemens A.G., Munich (West Germany).
THE TELECOMMUNICATION PAYLOAD OF THE SYMPHONIE SATELLITE [DIE FERNMELDETECHNISCHE NUTZLAST DES SATELLITEN SYMPHONIE]
H. Sodeikat 1972 26 p refs In GERMAN Presented at the 5th DGLR Ann. Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-89) Avail: NTIS HC $3.50

The preparations are described for measuring the telecommunication transmission parameters of the Symphonie satellite. The mission specifications and the telecommunication equipment are discussed. An antenna range in La Turbil (France) was chosen to determine the transmission characteristics. A model of the satellite, covered by a radome, was set up on a mountain ridge, and the measurements were carried out over a ravine 1450 m wide and 350 m deep. Ground reflections were minimal as a result of the topography. The satellite was mounted on a revolving table with adjustable azimuth and elevation angle. Special attention was paid to accurate EIRP measurements. Possible errors in measurement are accounted for. Author (ESRO)

N73-15200# Elliott-Automation Space and Advanced Military Systems, Ltd., Camberley (England).
SIDE-LOOKING RADAR SYSTEMS AND THEIR POTENTIAL APPLICATION TO EARTH RESOURCE SURVEYS. VOLUME 6: SUMMARY
Aug. 1972 145 p
(Contract ESTEC-1537/71-el)
(ESRO-CR(P)-141) Avail: NTIS HC $9.25

A summary is given of a study whose purpose is to inform earth scientists on the application of side-looking radar to the remote sensing of earth resources. The aspects summarized are: the basic principles of side-looking radar; radar scattering from natural surfaces; data handling and analysis; application of side-looking radar in the earth sciences; and required research and development. Appendices include a history of side-looking radar, frequency band designations, and a list of applications. Author (ESRO)

N73-15201# SACLANT ASW Research Center, La Spezia (Italy).
DIGITAL FILTERING TECHNIQUES FOR BROADBAND BEAMFORMING
Aristides A. G. Requicha 1 Jul. 1972 39 p refs
(AD-746206; SACLANTCEN-TM-179) Avail: NTIS CSCL 17/1

Digital steering of broadband hydrophone arrays is studied from the viewpoint of digital filtering theory. Emphasis is placed on applications wherein the sampling frequency must be kept as low as possible, implying that accurate beamforming involves interpolating the signals samples. Finite-impulse-response filters are shown to provide convenient means for digital interpolation. Standard techniques for implementing such filters are reviewed and applied to the design of beamforming algorithms. Estimates are derived for the computing time and for the amount of core memory required by digital computer realizations of time-domain and frequency-domain beamforming processors. Author (GRA)

N73-15202# SACLANT ASW Research Center, La Spezia (Italy).
RESOLUTION LIMITATIONS OF A RANDOM INHOMOGENEOUS MEDIUM
Jens M. Hovem 1 Sep. 1972 26 p refs
(AD-750755; SACLANTCEN-TR-214) Avail: NTIS CSCL 17/1

Signals transmitted through a random and inhomogeneous medium will suffer from wavefront distortion and from time and frequency dispersion. This will generally impair the resolution with which target position and Doppler can be determined. Treating the resolution properties by means of ambiguity functions, the effects on range, angle and Doppler resolution of a particular simple type of random medium are considered. The effect of time and frequency dispersion on the range-Doppler ambiguity function is first reviewed. The effects that a random and spatially-dependent medium can have on range and angle resolution are discussed. Author (GRA)

N73-15203# Naval Research Lab., Washington, D.C.
PROPOSAL FOR A DEEP SEA SYSTEM FOR EVALUATING ACOUSTIC TRANSDUCERS (DEEPSEAT)
A. Z. Robinson, R. J. Bobber, and C. L. Buchanan 1 Sep. 1972 39 p refs
(RF11121403)
(AD-750666; NRL-MR-2514) Avail: NTIS CSCL 17/1

A program for solving the problem of evaluating transducers at elevated hydrostatic pressure when existing facilities are not adequate for that purpose is proposed. The program would develop a calibration platform to be lowered to the required depth in the deep ocean. The calibration experiments would be controlled from the ocean surface by means of a hardwire telemetry link. Measurement data would be telemetered back to the surface by the same link for processing and interpretation. Emphasis is placed upon the use of a minicomputer for control of the measurement procedures and for processing and display of the results. Author (GRA)

N73-15204# Naval Research Lab., Washington, D.C.
TAPE PLAYBACK AND SERIAL TIME DECODER FOR IFF (IDENTIFICATION FRIEND OR FOE) FLIGHT TEST INSTRUMENTATION Interim Report
Charles E. Quigley 3 Oct. 1972 27 p
(AD-750667; NRL-7450) Avail: NTIS CSCL 17/9

The tape playback and serial-time decoder described in the report has been developed for evaluating event data recorded on magnetic tape during flight tests of the Hartlobe/Diversity dual-antenna system for airborne IFF transponders. Means are provided to recover pulse-duration-modulated (PDM)-multiplexed data from five playback channels of the instrumentation tape recorder to provide ten data channels for 35-mm oscillographic film records. Also, a serial-time code from another playback channel is used to synchronize an internal clock to provide the capability to superimpose on the oscillographic film record the time of day that the flight test data were originally recorded. Though the internal clock is primarily intended for use with the magnetic tape playback, a means is also available for operation as a completely self-contained, crystal-controlled, electronic clock with serial and parallel output signals. Author (GRA)

N73-15205# Naval Research Lab., Washington, D.C.
POINT SCATTERER FORMULATION OF TERRAIN CLUTTER STATISTICS Final Report
G. R. Valenzuela and M. B. Laing 27 Sep. 1972 49 p refs
(NRL Proj. R02-37)
(AD-750668; NRL-7459) Avail: NTIS CSCL 17/9

The first-order statistics of terrain clutter are investigated theoretically and experimentally. The return from a point-scatterer (a scintillating signal) is used as a basis for generating the statistical properties of terrain clutter as observed by side-looking airborne radars. According to the model the limiting distributions

of terrain clutter are the Gaussian distribution and the distribution for a scintillating signal (specular clutter). An array of point-scatterers within the radar beam produces clutter which has long tails similar to those of a lognormal distribution. The convergence of the first-order statistics of a scintillating signal to the statistics of a sinusoidal signal is demonstrated. Also, the statistics of terrain clutter are inferred from data taken with the Naval Research Laboratory's Four Frequency Radar System by the Kolmogorov-Smirnov test of the cumulative distribution and by the computation of the first five central moments of the normalized radar cross section of terrain (in decibels).
Author (GRA)

N73-15206# Office of Telecommunications, Boulder, Colo. Inst. for Telecommunication Sciences.
PROPAGATION OF ELECTROMAGNETIC WAVES IN THE EARTH CRUST WAVEGUIDE FROM ELF TO VLF Interim Report
Kenneth P. Spies and James R. Wait 1 May 1972 81 p refs
(Contract NAonr-15-71; NR Proj. 081-270)
(AD-748331; TR-3) Avail: NTIS CSCL 20/14

Using an idealized model, the attenuation rate of the lowest order mode is calculated for a range of deep crustal conductivities. It is shown that attenuation rates may be as low as 1 db/100 km at 1 Hz for a waveguide conductivity less than 0.000001 mhos/m. Numerical values of the propagation parameters are appended.
Author (GRA)

N73-15207# Advisory Group for Aerospace Research and Development, Paris (France).
AEROSPACE TELECOMMUNICATIONS SYSTEMS
1972 349 p refs Proc. of the Tech. Meeting of the Avionics Panel (23d), London, 15-18 May 1972
(AD-749889; AGARD-CP-103) Avail: NTIS CSCL 17/2

The symposium was divided into five principal areas: Data Compression methods as related to particle count data and the transmission of imagery. Evaluation of image compression schemes are included. Digital Techniques covering efficient bandwidth utilization, delta modulation and Phase Shift Keyed receiver techniques. Included are adaptive techniques covering filtering, Fast Fourier Transform processor, sampled-data FM demodulator and transmission equalization. Satellite Communications treats propagation and system considerations of the tactical environment ground terminal measurements related to link signalling, spread spectrum multiple access and frequency and orbit utilization. System Considerations discusses automatic message switching and traffic handling, message processing facility and technical control, transmission performance and technical and economic considerations of digital/analog communications. Interference covers generation, detection and control related to telecommunications.
Author (GRA)

N73-15208# Naval Research Lab., Washington, D.C.
A FORTRAN COMPUTER PROGRAM TO CALCULATE THE RANGE OF A PULSE RADAR Final Report
L. V. Blake 28 Aug. 1972 59 p refs
(AD-749686; NRL-7448) Avail: NTIS CSCL 17/9

A Fortran computer program to calculate radar maximum range, written for the NRL CDC-3800 computer but adaptable to any computer with a Fortran compiler, is described. The computation follows previously established principles, with the pattern-propagation factors set equal to one, so that the range calculated is for free space in the sense that earth's surface effects are not taken into account. However, the effects of a standard atmosphere are included in the calculation. Reflection-interference effects can be separately described by using the calculated free-space range as an input to computer plotting programs. The program calculates the range for any specified probability of detection, false-alarm probability, and Swerling fluctuation case by using a slightly modified subroutine written by Fehlner and coworkers of the Johns Hopkins University Applied Physics Laboratory. Postdetection (noncoherent) integration is assumed. The system noise temperature is computed including effects of galactic, cosmic blackbody, solar, and tropospheric noise, and the tropospheric molecular absorption for oxygen and water vapor is calculated for a standard atmosphere. The effect of refraction on the ray path is included in the absorption calculation by ray tracing, assuming a negative-exponential refractivity-height profile. The range of validity of the noise temperature and absorption calculations is approximately 100 MHz to 100 GHz. The computation requires a few seconds with the CDC-3800 computer.
Author (GRA)

N73-15209# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A THEORY FOR OPTIMAL MTI (MOVING TARGET INDICATOR) DIGITAL SIGNAL PROCESSING. PART 2: SIGNAL DESIGN
Robert J. McAulay 4 Oct. 1972 60 p refs
(Contract F19628-73-C-0002)
(AD-750747; TN-1972-14-Pt-2; ESD-TR-72-217) Avail: NTIS CSCL 17/9

In part 1 of the report the optimum MTI receiver was derived and analyzed for the case in which the radar pulses were emitted from the transmitter equally spaced in time. For typical long range ATC surveillance radars, aliasing of the target and clutter spectra results in detecting blind speeds at multiples of approximately 70 knots. It is well known operationally that these blind speeds can be eliminated by staggering the transmitter PRF. Heretofore, there has been no thorough theoretical analysis of the effect of staggered PRF on the spectral distribution of the target and clutter signals. It is shown in part 2 that the clutter spectral density continues to fold over at the PRF, but that the signal spectrum becomes dispersed in frequency, somewhat like an anti-jam signal. It is further noted that even when the target Doppler shifts are more than one PRF apart, the spectra are distinguishable, suggesting that unambiguous Doppler estimation may be possible.
Author (GRA)

N73-15210# Army Air Defense Board, Fort Bliss, Tex.
MISS DISTANCE RADAR (MIDI) - A DEVELOPMENT FOR AIR DEFENSE WEAPONS TESTING
Charles E. French 1972 16 p refs
(AD-750323) Avail: NTIS CSCL 17/9

Through the support of U. S. Army Test and Evaluation Command (TECOM) Instrumentation Development Program, U. S. Army Materiel Command (AMC), a modern miss distance measuring system is under development. The system embodies a ground-based radar system and effectively offsets the limitation of optical instrumentation. The feasibility for the concept was developed by the U. S. Army Air Defense Board, demonstrated during 1970, and culminated in a series of live firing tests at Fort Bliss, Texas.
Author (GRA)

N73-15211# Army Missile Command, Redstone Arsenal, Ala.
RADAR ARRAYS WITH NO PHASE SHIFTERS
Richard L. Hartman 1972 15 p refs
(AD-750328) Avail: NTIS CSCL 17/9

The purpose of this paper is to explain the unphased array concept and to demonstrate detection of simulated targets with this approach. Application is in the area of air defense systems.
GRA

N73-15212# Army Electronics Command, Fort Monmouth, N.J.
DOPPLER TRANSLATOR
Otto E. Rittenbach 1972 15 p refs
(AD-750370) Avail: NTIS CSCL 17/9

Different Doppler processors have been evaluated for their suitability to overcome various shortcomings. The paper concentrates on applications to Combat Surveillance Radars, especially those requiring small weight and power consumption. Theoretical and experimental studies were made of techniques suitable for presentation of marginally audible Doppler frequencies to the ear: amplitude modulation and time compression show promise. Tests with a breadboard model confirmed the predictions of the study.
GRA

N73-15213# Naval Submarine Medical Center, Groton, Conn.
RESPONSE VARIATIONS OF THREE TYPES OF MICROPHONES PRESSURIZED TO 19 ATA Interim Report
Thomas Murry and Russell L. Sergeant 3 Dec. 1971 18 p refs
(AD-750650; NSMRL-690; IR-8) Avail: NTIS CSCL 17/2

The purpose of the study was to determine what changes three types of microphones undergo during compression and decompression to 19 ATA (equiv. to 600 feet of sea water),

using a mixture of helium and oxygen. A reciprocity calibrated ceramic microphone was used as the standard for observing the changes of a cardioid (ribbon) type condenser microphone. The results indicate that sensitivity of all microphones decreases as ambient pressure increases. In addition, there are substantial changes in the linearity of the transducers especially at frequencies above 3000 Hertz. The ceramic microphone demonstrated the most consistent responses during descent and ascent. At 17 hours post-dive, it also showed a frequency response that was within one db of the pre-dive values at all frequencies tested. From this investigation, it would appear that none of the three types of microphones is ideally suited for speech communication in helium-oxygen environments due to the roll off in sensitivity at the high frequencies at depths greater than 200 feet.
Author (GRA)

N73-15214# Naval Training Equipment Center, Orlando, Fla.
EVALUATION OF DATA COMPRESSION TECHNIQUES FOR RADAR LANDMASS TERRAIN DATA
Alexander James Grant Jul. 1972 172 p refs
(AD-750695; NAVTRAEQUIPCEN-IH-211) Avail: NTIS CSCL 17/9

The objective of this research is to develop an objective evaluation method for determining the goodness of various data compression techniques applied to radar landmass simulation data, to validate the objective evaluation method by comparison with a subjective evaluation performed by experienced radar operators and to compare the objective evaluation with the currently used terrain RMS error criteria. This research consists of the computation of simulated radar shadow displays, the computation of various measures of goodness which are combined in a performance criteria, and the subjective evaluation of the simulated displays. The objective evaluation method which is developed measures the goodness of the data compression techniques in terms of the usefulness of the simulated radar displays. The results obtained demonstrate the inadequacy of the terrain RMS error criteria and the degrading smoothing effect introduced by polynomial data compression. It is recommended that, prior to the implementation of any terrain data compression technique in a radar landmass simulator, it be evaluated in the manner proposed. Author (GRA)

N73-15215# Naval Intelligence Support Center, Washington, D.C. Translation Services Div.
PASSIVE RADAR
A. Nikolaev 29 Sep. 1972 11 p Transl. into ENGLISH from Aviats. Kosmonavika (USSR), no. 1, 1964 p 73-77
(AD-750855; NISC-TRANS-3347) Avail: NTIS CSCL 17/9

The report discusses the uses and limitations of passive radar. GRA

N73-15216# Naval Intelligence Support Center, Washington, D.C. Translation Services Div.
SHIPBOARD RADARS AND THEIR USE
Ya. I. Berman, V. I. Vlasov, N. L. Kogan, V. I. Rakov, V. L. Skvortsov, and P. I. Lutskiy 29 Sep. 1972 131 p refs Transl. into ENGLISH from the book "Sudovye Radioloksionnye Stantsii i ikh Primenenie, v. 2" Leningrad, Izd. Sudostr., 1970 p 274-342, 437-503
(AD-750871; NISC-TRANS-3348) Avail: NTIS CSCL 17/9

Contents: Antenna Systems; Controlling antenna patterns; Automatic target tracking systems. GRA

N73-15217# Ohio State Univ., Columbus.
COMPUTATION OF LOW FREQUENCY SCATTERING FROM AIRPLANES
Y. T. Lin Sep. 1972 77 p refs
(Grant AF-AFOSR-1710-69; AF Proj. 9769)
(AD-750486; ESL-2768-9; AFOSR-72-1991TR) Avail: NTIS CSCL 17/9

An efficient computational technique for obtaining radar scattering cross sections of electrically small airplanes is achieved by using a wire-grid reaction method. In this method, the airplane shape is approximated by a grid of thin wires, thereby leading to a mathematical representation of the airplane in the form of matrix, whose elements are evaluated by established reaction techniques, and which when inverted, yield scattering data very efficiently. A variety of wire-grid approximations were postulated for square plates, circular cylinders and several airplane types. Author (GRA)

N73-15218# Center for Communications Research, Inc., Rochester, N.Y.
A STUDY OF THE CAPABILITY OF GRAMMATICAL ANALYSIS TO IMPROVE ACCURACY IN CONTINUOUS SPEECH RECOGNITION FOR COMMAND AND CONTROL
Interim Scientific Report
Wilbur D. Larkin and William B. Newcomb 30 Jun. 1972 25 p refs
(Contract F44620-71-C-0090; AF Proj. 9769)
(AD-746333; AFOSR-72-1342TR) Avail: NTIS CSCL 17/2

The speech samples, or utterances, are digitized on premises by off-line computer I/O station and recorded on 7-track magnetic tape in computer acceptable format. Following the conversion of the data to conventional IBM form, a spectrum analysis is performed. A short-time spectrum is generated for approximately each 10 ms of data (the increment is 96 data points). A Hamming window function is used to reduce the sidelobes (or leakage); the window is approximately 30 ms long (270 data points). The primary emphasis of the effort to date has been on the grammatical analysis portion of the work. The effort in speech signal analysis has been directed at providing data for demonstration of the grammatical analysis system, rather than optimization of the speech signal analysis programs. Author (GRA)

N73-15390* General Electric Co., Utica, N.Y. Aerospace Electronic Systems Dept.
ALTITUDE ERRORS ARISING FROM ANTENNA/SATELLITE ATTITUDE ERRORS - RECOGNITION AND REDUCTION
Thomas W. Godbey, Ron Lambert, and Gary Milano *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 24 p
(For availability see N73-15369 06-13)
CSCL 17I

08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

N73-15219 National Lending Library for Science and Technology, Boston Spa (England).
ON THE WORD PROBLEM FOR CERTAIN FORMAL LANGUAGES
A. Mazurkiewicz [1972] 66 p refs Transl. into ENGLISH from Algorytmy (Poland), v. 8, no. 4, 1968 66 p
(NLL-SMRE-TRANS-5884-(8313.4)) Avail: Natl. Lending Library Boston Spa, Engl.: 6 NLL photocopy coupons

Recognition and parsing algorithms for phrase structure languages are discussed. The main result is that for each context free language there exists a context-sensitive language which is equivalent to the given language, and is much simpler with respect to the recognition and parsing process. The transforming and recognition algorithms are given. Author

N73-15220# Research Inst. of National Defence, Stockholm (Sweden).
A DESCRIPTION OF THE FUNCTION OF KODAR
Nils-Erik Vall and Orjan Carlson Feb. 1971 50 p In SWEDISH
(FOA-3-C-3657-63) Avail: NTIS HC $4.50

Construction and functional description of the KODAR computer system are reported. Block diagrams and graphical drawings of logic circuits and processing units for the digital computer are included. Transl. by G.G.

N73-15221# Research Inst. of National Defence, Stockholm (Sweden).
SUBROUTINES FOR TIME SERIES ANALYSIS
Krister Eriksson and Sven Olofsson Apr. 1971 40 p refs In SWEDISH
(FOA-3-C-3672-64(11)) Avail: NTIS HC $4.00

Subroutines written in FORTRAN 4 are described. These subroutines are intended for the estimation of the following functions in time series: autocovariance, cross covariance, effect

spectrum, cross spectrum, coherence, and the ratio cross spectrum/effect spectrum. Covariances and spectra are calculated via the time series discrete Fourier transforms by means of Cooley-Tukey algorithms. Some subroutines for the calculation of the discrete Fourier transforms with named algorithms are also included. Author

N73-15222# Research Inst. of National Defence, Stockholm (Sweden).
FORTRAN ROUTINES FOR EVALUATION OF FILMS TAKEN WITH THE RESEARCH STATION'S DRUM CAMERA
Ake Johnsson Jun. 1971 39 p ref In SWEDISH
(FOA-2-C-2475-11-44) Avail: NTIS HC $4.00

A FORTRAN program is described for the evaluation of films from a drum camera in order to determine the velocity of shell fragments. The film records three images of each fragment as it passes three beams of light placed centrally opposite to the camera. The coordinates of each fragment are punched on cards together with the coordinate axes for each setup. The program carries out the scale and coordinate transformation of input data and calculates the dispersion velocity for each fragment and attempts to correct all fragments for any mistakes in identification. Author

N73-15223# Research Inst. of National Defence, Stockholm (Sweden).
FORTRAN ROUTINES FOR APPROXIMATION WITH RI (SPLINE) FUNCTIONS
Bo Einarsson and Bengt Sjoegren Jun. 1971 26 p refs In SWEDISH
(FOA-2-C-2476-11) Avail: NTIS HC $3.50

Computer routines were developed for interpolation and integration where approximation with cubic splines are included. These routines were applied to varied programs. Author

N73-15224# Research Inst. of National Defence, Stockholm (Sweden).
COMPUTER GENERATION OF PATTERNS FOR ANALYSIS OF THE VISUAL PERCEPTION OF FORM
J.-O. Eklundh May 1971 22 p refs
(FOA-2-C2473-52) Avail: NTIS $3.25

The programs are to be used in the study of human visual perception, making it possible to produce stimuli with known properties. It is delineated how stimuli of an arbitrary complexity can be obtained by the same method. Several problems that can be studied with this technique are stated, and the connections to pattern analysis by machine are discussed. Author

N73-15225*# National Aeronautics and Space Administration, Washington, D.C.
REPORT OF THE TAPE RECORDER ACTION PLAN COMMITTEE, 21 MARCH 1972
21 Mar. 1972 52 p refs
(NASA-SP-307) Avail: NTIS HC $3.00 CSCL 14C

A NASA/AF Tape Recorder Action Plan Committee was formed in January 1972 to investigate tape recorder problems and to recommend an action plan to NASA management. The committee collected data on tape recorder failure history, pinpointed problem areas, discussed needed technical and management changes, and proposed an action plan for the recommended approaches. Author

N73-15226*# Stanford Univ., Calif. Dept. of Computer Science.
COMPUTER INTERACTIVE PICTURE PROCESSING
Lynn H. Quam, Sidney Liebes, Jr., Robert B. Tucker, Marsha Jo Hannah, and Botond G. Eross Apr. 1972 48 p refs
(Contract NAS1-9682; ARPA Order 457)
(NASA-CR-130305; AD-743589; CS-72-281; AIM-166) Avail: NTIS HC $4.50 CSCL 09B

Work done in image processing using an interactive computer system is reported. Techniques for image differencing are described and examples using images returned from Mars by the Mariner Nine spacecraft are shown. Also described are techniques for stereo image processing. Stereo processing for both conventional camera systems and the Viking 1975 Lander Camera System is reviewed. Author

N73-15227*# TRW Systems Group, Redondo Beach, Calif. Space Sciences Dept.
GSFC SUPPORT FOR E-24 DATA REDUCTION AND ANALYSIS Final Report
Frederick L. Scarf Nov. 1972 13 p refs
(Contract NAS5-9278)
(NASA-CR-130140; TRW-05402-6040-RU-00) Avail: NTIS HC $3.00 CSCL 09B

Reduced and analyzed data from the plasma wave detector on OGO E spacecraft are reported. The bibliography lists 74 publications in scientific books and journals which highlight the analysis program. G.G.

N73-15228# Atomic Weapons Research Establishment, Aldermaston (England).
TWO-DIMENSIONAL RAY-TRACING PROGRAM
A. R. Curtis May 1972 153 p refs
(AWRE-O-34/72) Avail: AEC Depository Libraries; UK £1.00

The digital-computer program described is written in FORTRAN 4 for the IBM 7030 (Stretch) computer for tracing the paths of high-frequency electromagnetic rays through two-dimensional models of the ionosphere, omitting the effects of the geomagnetic field and electron collisions from the evaluation of refractive index. The program also computes phase and group-path data and absorption along the rays, and signal-strength calculations are available as an option. A variety of outputs are obtainable in the form of printed tables, punched cards and ray-path plots. Each component of the program is briefly described, and FORTRAN listings and definitions of variables are provided. Examples of ionospheric models are given and the report indicates how alternative models may be written into the program. Author (NSA)

N73-15229# Standard Electrik Lorenz A.G., Stuttgart (West Germany).
THE ONBOARD DATA PROCESSING SYSTEM OF THE HELIOS SOLAR PROBE [DAS DATENVERARBEITUNGS-SYSTEM AN BORD DER HELIOS-SONDE]
D. Pabst 1972 16 p In GERMAN Presented at the 5th DGLR Ann. Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-092) Avail: NTIS HC $3.00

The principles of the onboard data processing system for the Helios solar probe are outlined. A flexible data processor is necessary because of the orbit with a maximal distance of 2 AE from the earth. The most important characteristics of the data processing system are: four different telemetry formats for scientific data detected by a special program and stored in core with high resolution; command-controlled data flow during blackout times; and coding of telemetry and command data. There are 256 single commands apart from the transmission of 8 bit words over the command link, about 320 control data and a core storage of 0.5 Mbit. The system consists of six instruments, in which 190 cards with about 2000 IC's have been used. Author (ESRO)

N73-15230# Royal Greenwich Observatory, Herstmonceux (England).
COMPUTER PROGRAMME FOR DIFFERENTIAL CURVE-OF-GROWTH ANALYSIS
A. L. T. Powell Apr. 1971 22 p refs
(Roy-Obs-Bull-171) Avail: NTIS HC $3.25

Computer programs are described which undertake a complete curve-of-growth analysis, using measurements of the dimensions of stellar lines as input data. The programs perform the analysis in a number of distinct stages, and the final results are presented in graphic or tabular form. Author (ESRO)

N73-15231# Royal Aircraft Establishment, Farnborough (England).
OPERATING THE RADIO DEPARTMENT REMOTE COMPUTER TERMINAL EQUIPMENT
K. Green Jul. 1972 67 p refs
(RAE-TR-72086; BR-29636) Avail: NTIS HC $5.50

The facilities available with the ICL 7020 computer terminal under the control of the operating system George 3 Mk.6 are described. Additional terminal equipment is briefly discussed. Author (ESRO)

N73-15232# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
A SOLID STATE REPLACEMENT FOR SATELLITE TAPE RECORDERS
R. F. Plachy Jul. 1972 83 p refs
(Contract N00017-72-C-4401)
(AD-750660; APL-TG-1194) Avail: NTIS CSCL 09/2

Magnetic bubble circuits are a new type of integrated circuit employing movable magnetic domains. Because of the internal structure of magnetic bubble circuits, the most obvious applications are those involving serial data coding or storage. The report describes the operation of bubble devices and presents a detailed design of a bubble memory system for bulk data storage. This system is shown to have special application to satellite memory systems as a substitute for the present tape recorder memories. In this application the magnetic bubble memory appears to be superior to the tape recorder in power, size, and reliability. A 6 megabit bubble memory is described and a comparison made with the 6 megabit tape recorder used on the SAS-A satellite.
Author (GRA)

N73-15233# Naval Underwater Systems Center, Newport, R.I.
FAULT DETECTION IN SEQUENTIAL MACHINES
T. T. Tylaska 14 Sep. 1972 176 p refs
(AD-750266; NVSC-TR-4421) Avail: NTIS CSCL 09/2

Sequences and techniques useful in the design of checking experiments are examined. Necessary and sufficient conditions are formulated for a machine to possess distinguishing and synchronizing sequences. Characterizing sequences are examined in detail and a previous bound is reduced by 50 percent to obtain the least upper bound on their total length. Better use is made of the strong connectedness of tested machines to achieve a 50 percent reduction over previous bounds on the length of transfer sequences. Both the reduced bounds on characterizing and on transfer sequences are used to derive a bound smaller than those published on the length of checking for a machine possessing a simple I/O sequence and a valid homing sequence. Both resettable and non-resettable machines are examined to determine the effect of the reset feature upon the length of checking experiments. Author (GRA)

N73-15234# Army Advanced Ballistic Missile Defense Agency, Huntsville, Ala.
DATA PROCESSING SYSTEM ANALYSIS
Charles R. Vick 1972 16 p
(AD-750389) Avail: NTIS CSCL 15/3

The design, development, and test of real-time software for implementation in a ballistic missile defense data processing system is one of the most challenging undertakings that computer scientists have had to come to grips with. Just as the hardware architects responsible for the super computers of today, which employ gate counts in the millions, have evolved rigid disciplines and employed high degrees of automation to successfully deploy their product, the software architects of the super computers are establishing a software engineering technology. The paper describes a program directed toward identifying and implementing the beginnings of such a technology. Its major goal was to pioneer techniques which would make manageable and offer visibility and confidence in massive real-time software systems such as those required in ballistic missile defense.
Author (GRA)

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N73-15235* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MAGNETICALLY ACTUATED TUNING METHOD FOR GUNN OSCILLATORS Patent
Barry H. Sacks, inventor (to NASA) Issued 26 Sep. 1972 6 p
Filed 30 Aug. 1971 Sponsored by NASA
(NASA-Case-NPO-12106; US-Patent-3,694,771; US-Patent-Appl-SN-175881; US-Patent-Class-331-107G; US-Patent-Class-317-234V; US-Patent-Class-317-235K; US-Patent-Class-317-235AG; US-Patent-Class-331-90; US-Patent-Class-331-177R) Avail: US Patent Office CSCL 09E

A tunable microwave generator based on the Gunn effect is disclosed. The generator includes a semiconductor material which exhibits the Gunn effect when current flows between anode and cathode end contacts. The material has a plurality of sides each with a scratch at a different distance from the anode contact. A magnetic field is produced by a magnet placed about the semiconductor field. The Lorentz force produced as a function of the current flow and the magnetic field drive the electrons to the surface of one of the sides to cause nucleation to occur at the scratch. A domain formed thereat travels to the anode contact to provide pulses at a frequency which is related to the distance between the scratch and the anode contact.
Official Gazette of the U.S. Patent Office

N73-15236# Pisa Univ. (Italy). Inst. of Electronics and Radio Controls.
ON THE POSSIBILITY OF REALIZING SELECTIVE AMPLIFICATION USING THE INTRINSIC PHASE DIFFERENCE OF TRANSISTORS [SULLA POSSIBILITA DI REALIZZARE AMPLIFICATORI SELETTIVI UTILIZZANDO LO SFASAMENTO INTRINSECO DEI TRANSITORI]
Fulvio Capparelli and Antonino Liberatore 1971 31 p refs In ITALIAN *Its* Ser. 28a
(Publ-1369; Publ-13) Avail: NTIS HC $3.75

A technique is presented for developing selective amplifiers which use the intrinsic phase of the transistor to eliminate inductive capacitance components. The circuit is presented which satisfies the Horowitz decomposition when the center band frequency is compressed in a wide working field dependent on the cutoff frequency of the transistor. Transl. by F.O.S.

N73-15237# Pisa Univ. (Italy). Ist. di Elettronica e Radiocontrolli.
ON THE INTERNAL OSCILLATIONS OF A MOTOR WITH SEPARATE EXCITATION, REGULATED BY A NEGATIVE RESISTANCE FEED [SUR LES OSCILLATIONS INTRETENUES D'UN MOTEUR A EXCITATION SEPAREE, REGULEE PAR UN ALIMENTATEUR A RESISTANCE NEGATIVE]
F. Capparelli and G. Marola 1971 49 p refs In FRENCH
(Publ-1368; Publ-12) Avail: NTIS $4.50

After discussing the operating principles of a regulation system for controlling the static angular velocity of a separately excited motor, a nonlinear differential equation is proposed for obtaining the dynamic properties of the system. An integration method for obtaining analytical expressions for cycle limits is examined.
Transl. by E.H.W.

N73-15238# Defence Research Information Centre, Orpington (England).
VIDICONS OF INCREASED SENSITIVITY
A. S. Markisov et al Nov. 1972 9 p refs Transl. into ENGLISH from Tekh. Kino i Telev. (Moscow), v. 6, Jun. 1972, p 53-55
(DRIC-Trans-2965; BR-30329) Avail: NTIS HC $3.00

Vidicons are examined, which are analogous to Soviet-made models LI-419 and LI-420 with regard to their electronic and optical characteristics but having a higher sensitivity. The variations in the signal and dark current strength of various types of target are also considered. Author (ESRO)

N73-15239# Army Electronics Command, Fort Belvoir, Va. Night Vision Lab.
MEASUREMENT OF THE ANGULAR DISTRIBUTION OF PHOTOELECTRONS FROM THIRD GENERATION PHOTOCATHODE MATERIALS
John H. Pollard 1972 15 p refs
(AD-750364) Avail: NTIS CSCL 09/1

The experimental measurements of the angular distribution of photoemitted electrons from cesium-oxygen activated p-type GaAs surfaces show a highly directional photoemission approximately independent of the surface orientation. The mathematical model explaining these observations shows the expected Lambertian distribution is modulated by a strong exponential

function resulting from the attainment of negative electron affinity conditions. GRA

N73-15240# Minnesota Univ., Minneapolis. Inst. of Tech.
STUDY OF NOISE IN SPACE-CHARGE-LIMITED SOLID STATE DEVICES, 2 Final Report, 16 Dec. 1970 - 15 Jun. 1972
A. Vander Ziel Aug. 1972 32 p refs
(Contract DA-31-124-ARO(D)-291; DA-ARO(D)31-124-71-G130)
(AD-750186; AROD-5117-29-E) Avail: NTIS CSCL 09/1

The problems of noise in single and double injection diodes have been solved both in principle and detail. Author (GRA)

N73-15241# Army Electronics Technology and Devices Lab., Fort Monmouth, N.J.
MILLIMETER WAVE QUASI-OPTICAL TECHNIQUES FOR DEVICE AND CIRCUIT FUNCTIONS
Metro Chrepta and Harold Jacobs 1972 15 p refs
(AD-750317) Avail: NTIS CSCL 09/1

The concept of high resistivity semiconductor waveguides offers the following: Low transmission loss for radiation over large regions of the spectrum; Low cost, since guides can be machined and polished from the outside rather than from the inside, and have flexibility in construction; Design of devices in the propagating medium; and, because transmission is in a relatively high dielectric, the energy is transmitted in an oversized guide mode, and broader bandwidths are possible.
Author (GRA)

N73-15242# Army Electronics Command, Fort Monmouth, N.J.
RARE EARTH COBALT PERMANENT MAGNET MATERIALS FOR ELECTROMECHANICAL ENERGY CONVERSION DEVICES
G. Lafrate, R. L. Ross, F. Rothwarf, and C. Campagnoulo 1972 16 p refs
(AD-750338) Avail: NTIS CSCL 09/1

In the past few years, considerable research has been conducted on binary and ternary alloy systems of the 3d transition elements with metals of the rare-earth group (elements with nuclear charge 21, 39 and 57 through 71). These studies have revealed many new ferro- and ferrimagnetic substances. The most impressive of these new alloys are those based on the hexagonal intermetallic cobalt rare-earth (RE) compounds Co5RE. In this paper, the authors present new designs which use these materials in the development of a compact electronically tunable high field dc magnet for use in microwave filters and power limiters as well as in the design of power generators for use in artillery fuzing applications. GRA

N73-15243# Naval Research Lab., Washington, D.C.
A FORTRAN SUBROUTINE FOR PLOTTING A SMITH CHART Interim Report
John R. Brinson Oct. 1972 23 p refs
(AD-751019; NRL-MR-2517) Avail: NTIS CSCL 09/1

Computer determined waveguide or transmission line parameters can now be shown on a Smith Chart plotted by the subroutine described in the report, saving tedious and time-consuming manual plotting. Also included is a subroutine, ADMTPLT, which selects the data to be plotted on the Smith Chart. All control for the plotting of the charts and the data to be plotted is implemented in the main program. The effect of varying one parameter in the computation of data may be investigated by plotting more than one set of data on each chart. Appendix A shows the development of the algorithms for plotting the Smith Chart, and Appendix B shows the FORTRAN subroutine in a demonstration program. A sample plot is shown. Author (GRA)

N73-15244# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
PRECISION SINGLE SIDEBAND CRYSTAL UNITS Semiannual Report, 15 Dec. 1971 - 15 Jun. 1972
Raymound K. Hart and Walter H. Hicklin Aug. 1972 49 p refs
(Contract DAAB07-72-C-0087)
(AD-749642; GIT-A-1388-S; ECOM-0087-1) Avail: NTIS CSCL 09/1

The purpose of this work is to develop single sideband (SSB) quartz crystal units which meet a strict aging requirement, i.e., 2 X 10 to the minus 10th power/week, when measured at the upper turning point (66C) of the crystal unit after a stabilization period of four weeks. These resonators are to be used in temperature compensated crystal oscillators (TCXO), where the operating temperature will be variable from about -55 to -90C. The use of a TCXO for on-frequency operation rather than an ovencontrolled crystal oscillator (OCXO) eliminates the need for a fast warm-up oven. However, the problem of frequency hysteresis that may occur under conditions of varying temperature still exists. Author (GRA)

N73-15245# Radio Corp. of America, Lancaster, Pa. Electro-Optics Products.
PHOTOMULTIPLIER TUBE FOR EFFICIENT INFRARED DETECTION Quarterly Report, 22 Sep. - 21 Dec. 1971
D. G. Fisher and F. R. Hughes Sep. 1972 36 p refs
(Contract DAAB07-70-C-0273)
(AD-749645; ECOM-0273-6; QR-6) Avail: NTIS CSCL 17/5

Developmental emphasis during the quarter reported on was primarily upon (1) optimization of growth techniques, (2) development and optimization of photocathodes activation techniques and (3) development of tube activation and fabrication techniques. Experience indicated that research facilities cannot, by their nature, effectively supply large quantities of materials. Rather, a system which is dedicated to producing a singular type of material is required, and is in use at RCA-Lancaster. Results are tabulated for composition control experiments, activation technique development, and sensitivities and QE achieved at various doping levels. A schematic is presented of processing steps used in activating III-IV samples to a state of negative electron affinity. Author (GRA)

N73-15246# California Univ., Los Angeles. School of Engineering and Applied Science.
ADAPTIVE ROUTING TECHNIQUES FOR MESSAGE SWITCHING COMPUTER-COMMUNICATION NETWORKS
Gary Lee Fultz Jul. 1972 427 p refs
(Contract DAHC15-69-C-0285)
(AD-749678; UCLA-ENG-7252) Avail: NTIS CSCL 09/2

The report considers adaptive routing techniques applicable to message switching computer-communication networks such as the ARPA network. The emphasis of this research is on the prediction of average message delay and the specification, implementation and evaluation of various classes of message routing procedures. The report includes a one-page GPSS program. Author (GRA)

N73-15247# Radio Corp. of America, Princeton, N.J.
OPTOELECTRONIC ELECTRON EMITTER Semiannual Report, 1 Jan. - 30 Jun. 1972
Horst E. Schade, Henry Kressel, and Harry F. Lockwood Oct. 1972 29 p refs
(Contract DAAB07-71-C-0059; ARPA Order 1686)
(AD-750611; PRRL-72-CR-40; ECOM-0059-3) Avail: NTIS CSCL 09/1

The electron energy distribution of a semiconductor cold-cathode based on negative electron affinity was measured. The half-width of the energy distribution of electrons, emitted from a GaAs-(AlGa)As structure, was found to be 160 meV which is distinctly narrower than that for a conventional thermionic cathode. The measured half-width is in fair agreement with calculations that take into account energy losses suffered by the electrons in the space-charge region below the surface. Author (GRA)

N73-15248# Naval Research Lab., Washington, D.C.
SIGNAL PROCESSING ELEMENT FUNCTIONAL DESCRIPTION. PART 2: PRELIMINARY, SIGNAL PROCESSING ARITHMETIC UNIT Interim Report
William R. Smith and Harold H. Smith Oct. 1972 54 p refs
(AD-750665; NRL-MR-2522-PT-2) Avail: NTIS CSCL 09/2

The NRL Signal Processing Element (SPE) is being developed to provide a high-performance signal processing facility for radar, sonar, and communication systems. It is intended to be compatible with the Navy's All Applications Digital Computer (AADC). The SPE consists of four major subsystems; a Microprogrammed Control Unit (MCU), a Buffer Store and Storage Control Unit

(SPU), a Signal Processing Arithmetic Unit (SPAU), and Input/Output (I/O) units. Author (GRA)

N73-15249# Pacific Missile Range, Point Mugu, Calif.
AN INVESTIGATION OF SYNTHETIC INDUCTORS
J. A. Means 14 Aug. 1972 393 p refs
(AD-749685; PMR-TP-72-6) Avail: NTIS CSCL 09/1

The purpose of this research is to investigate various methods of inductor simulation to characterize and establish the performance constraints of each method. The majority of the methods are shown to produce a driving point impedance function having a single zero and a single pole. Therefore, a generalized equivalent circuit for most of the realizations studied is equivalent to an R-L-R circuit. A program called ROOTLO is developed as an aid in classical stability analysis. Degenerate circuit elements are presented as a conceptual aid in the design process. Several approaches to inductor simulation are investigated. These methods are the capacitively loaded VCT gyrator, the capacitively loaded CVT gyrator, other controlled sources, and the intrinsic parameter approach which does not require an external capacitor. Actual circuits including element values and operating characteristics are included for each realization considered. A brief description of the power inductor is included, and a class B VCT gyrator is given. Author (GRA)

N73-15250# Hughes Aircraft Co., Culver City, Calif. Electronic Properties Information Center.
MATERIALS AND INTERFACE FACTORS LIMITING LSI (LARGE SCALE INTEGRATED CIRCUITS) PERFORMANCE AND RELIABILITY
Thomas C. Hall, Robert H. Boschan, and William G. Brammer Aug. 1972 48 p refs
(Contract DSA900-72-C-1182)
(AD-750577; EPIC-IR-81) Avail: NTIS CSCL 09/1

Material, chemical, physical, metallurgical and electrical effects in large scale integrated circuits (LSI) and other semiconductor devices are surveyed. Material transport phenomena, thermochemical and electrochemical effects, properties of metallization systems for semiconductor devices and semiconductor surface effects as they affect device performance and reliability are discussed. Eighty-nine references are provided. Author (GRA)

N73-15251# Frankford Arsenal, Philadelphia, Pa.
APPLICATION OF IMAGE UP-CONVERSION TO NIGHT FIRE CONTROL
Joseph A. Schmitz 1972 15 p refs
(AD-750374) Avail: NTIS CSCL 09/1

Reports such as the U.S. Army ENSURE 78 RVN evaluation of the AN/AAQ-5 FLIR under actual combat conditions attest to the potential of far infrared imaging devices, in detecting, acquiring, and identifying targets at extended ranges. These systems, however, are not without their drawbacks; in particular, for the airborne case, their huge size and weight restricted aircraft performance and load carrying capacity; equipment and parts costs were high, unique operating environments were required for the FLIR detectors, and the systems proved to be unreliable and difficult to maintain. It was clear that more R and D would be required before lightweight, low cost and dependable FLIR systems could be fielded. Problems lead to the continued search for improvements in system concepts, designs and materials. Parametric Image-Up-Conversion is one such system concept which has recently generated considerable interest and, potentially, may prove to be a viable technique for developing an infrared imaging system free from many of the problems associated with FLIR. Author (GRA)

N73-15252# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROTECTION OF COMMUNICATION CABLES IN PLASTIC SHEATHS FROM LIGHTNING STRIKES
S. A. Sokolov, V. K. Orlov, and B. K. Goryunov 4 Aug. 1972 17 p refs Transl. into ENGLISH from Elektrichestvo (Moscow), no. 4, 1969 p 80-83
(AD-750642; FTD-MT-24-41-72) Avail: NTIS CSCL 09/1

From impulse generator tests on a cable 4 km in length (a one-quarter cable with polythene-insulated cores, an aluminum foil screen in the form of a two-layer winding of steel wires each 0.25 mm in diameter; enclosed in P.V.C. cover; outside diameter of cable of the order 15 mm), it was found that protection by earthing the cable screen along the line is generally less effective than protection by laying a lighting conductor of bimetal 0.25-0.35 m deep, although cost considerations and local conditions may influence the choice in particular cases. GRA

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

N73-15253# Pisa Univ. (Italy). Ist. di Elettronica e Radiocontrolli.
RESEARCH ON QUARTZ TECHNOLOGY WITH EMPHASIS ON CONTROLLING THE STABILITY OF OSCILLATORS WITH UNUSUAL REACTION RINGS, ON THE DEVELOPMENT OF QUARTZ FOR MINIATURE SYSTEMS AND ON THERMOSTATIC CONTROL BY QUARTZ SENSITIVE TO VARIATIONS IN TEMPERATURE [RICERCHE SULLA TECNOLOGIA DEI QUARTZI, CON PARTICOLARE RIFERIMENTO AL CONTROLLO DELLA STABILITA DI UN OSCILLATORE CON ANELLI DI REAZIONE NON TRADIZIONALI; REALIZZAZIONE DI QUARZI PER SISTEMI DI DIMENSIONI MOLTO RIDOTTE; TERMOSTATI CONTROLLATI DA QUARZI PARTICOLARMENTE SENSIBILI ALLE VARIZIONI DI TEMPERATURA]
R. Barsotti, R. Bedarida, and G. Guiraud 1971 51 p refs In ITALIAN Sponsored by CNR
(Publ-1366; Pub-10) Avail: NTIS HC $4.75

The development of frequency stabilized oscillators for thermostatic control is investigated, using quartz oscillators sensitive to variations in temperature. To reduce the dimensions, semiconductor integrated circuits are used. Transl. by F.O.S.

N73-15254# Pisa Univ. (Italy). Ist. di Elettrotecnica.
ELECTROMECHANICAL RESPONSE OF AN INDUCTION TRIPHASE MACHINE WITH VOLTAGE PERTURBATION IN THE FEEDER NETWORK [RISPOSTA ELECTTROMECCANICA DELLA MACCHINA TRIFASE A INDUZIONE ALLE PERTURBAZIONI DI TENSIONE SULLA RETE DI ALIMENTAZIONE]
F. Nencioni and R. Pieri Dec. 1970 9 p refs In ITALIAN
(Publ-1362) Avail: NTIS HC $3.00

The dynamic behavior of an induction motor for use in a digital computer is demonstrated. A procedure is presented for determining the general response of this machine to power perturbations, particularly voltage fluctuations. The procedure is based on a specific vector representation of the fluctuating voltage and transient currents. Using an appropriate equivalent circuit, the equations for electrical and mechanical equilibrium are derived for direct solution in the digital computer. Transl. by F.O.S.

N73-15255*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
CAPACITANCE MULTIPLIER AND FILTER SYNTHESIZING NETWORK Patent Application
Arthur J. Kline, inventor (to NASA) Filed 15 Nov. 1972 21 p
(Contract NAS7-100)
(NASA-Case-NPO-11948-1; US-Patent-Appl-SN-306652) Avail: NTIS HC $3.25 CSCL 09C

A circuit using a differential amplifier is reported that multiplies the capacitance of a discrete integrating capacitor by (R sub 1 + sub R 2) /R sub 2 where R sub 1 and R sub 2 are values of discrete resistor coupling an input signal e sub 1 to the amplifier inputs. The output e sub zero of the amplifier is fed back and added to the signal coupled by the resistor R sub 2 to the amplifier through a resistor R sub 1. A discrete resistor R sub x may be connected in series for a lag filter and a discrete resistor may be connected in series with the capacitor for a lead-lag filter. Resistor R sub a and R sub b may be included in the feedback circuit of the amplifier output e sub zero to independently adjust the overall circuit gain. NASA

N73-15256# Joint Publications Research Service, Arlington, Va.
USSR SCIENTIFIC ABSTRACTS: ELECTRONICS AND ELECTRICAL ENGINEERING, NO. 146

2 Jan. 1973 221 p refs Transl. into ENGLISH from various Russian publications
(JPRS-57877) Avail: NTIS HC $13.25

Abstracts are presented on electronic materials, components, and devices, on circuit theory, pulse techniques, electromagnetic wave propagation, radar, quantum electronic theory, development and devices, miniaturization techniques on electric power machinery, power transmission, and nuclear power developments. Author

N73-15257# Scientific Research Atomic Reactor Inst., Melekess (USSR).
REALIZATION OF SYNCHRONOUS ROTATION OF SOME ROTORS SUSPENDED IN A MAGNETIC FIELD
G. V. Rukolaine, S. M. Kalebin, G. A. Pelevin, and S. N. Nikolskii 1971 24 p refs In RUSSIAN
(SRARI-P-120) Avail: AEC Depository Libraries

A method for the synchronous rotation of any number of rotors suspended in a magnetic field is considered. The advantage is taken of such distinctive features of suspension in a magnetic field as low friction during rotation of the rotors, and the absence of mechanical effects on the angular rate of rotation. The operational principle of electronic tracing circuits made for specified synchronization is described. The following technical characteristics are available in the arrangement developed: the rotation period of the rotors suspended in a magnetic field varies no more than 0.25 microseconds, and their synchronous rotation measured at the rate of 6000 rpm is performed accurately to plus or minus 0.04 deg. Author (NSA)

N73-15258# Union Carbide Corp., Oak Ridge, Tenn. Y-12 Plant.
COMPUTER-ASSISTED OPERATION OF AN ELECTRONIC MAINTENANCE TEST SYSTEM
D. E. McMillan 10 Jul. 1972 104 p refs
(Contract W-7405-eng-26)
(Y-1837) Avail: NTIS

The application of a small digital computer to improve the operation of an automatic test system was investigated. The objectives of using a computer as a control element were improved communication between the test system and its operator and a reduction in the number of system tests required for diagnostic testing. Interface circuits and operating programs were designed and built, and the test system was operated under computer control to study the practicality of improving the performance of the test system. Unexpectedly large amounts of computer memory were required to support the teletype communications system, and it was discovered that a careful balance must be made between message clarity and length. Interface hardware was most effective when it had the simplest form; and it was concluded that, whenever a choice is possible, software rather than hardware should be used to implement a control function. Author (NSA)

N73-15259# Tennessee Univ., Knoxville. Dept. of Physics.
ELECTRONIC PROPERTIES OF LIQUIDS Annual Progress Report
Linda R. Painter [1972] 16 p refs
(Contract AT(40-1)-3861)
(ORO-3861-6) Avail: NTIS

The optical properties of liquid glycerol were measured by several methods from 2.6 to 22.4 eV. Optical and dielectric data were interpreted in terms of a molecular excitation of the sigma electrons and also a collective oscillation of these same electrons. Simultaneously with measurements on glycerol, studies were completed on two long chain hydrocarbons, tetradecane, $C_{14}H_{30}$, and heptadecane, $C_{17}H_{36}$. Reflectance measurements were made on these liquids at 15 degree angle of incidence in the spectral region from 2 to 20 eV. Preliminary studies were made on undecane, $C_{11}H_{24}$. Values of n and k were obtained from a Kramers-Kronig analysis of the near-normal incidence reflectance. Reflectance measurements on liquid water were extended from the previous limit of 14.9 eV to 25.6 eV. Structure in the dielectric functions possibly indicate a collective effect near 21 eV, as predicted by Platzman. Author

N73-15260# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CALCULATION OF THE DISTRIBUTION OF PULSE VOLTAGE IN A NETWORK OF SERIESCONNECTED SEMICONDUCTOR RECTIFIERS
M. N. Novikov, I. D. Pashentsev, and V. A. Zavyalov 11 Aug. 1972 16 p refs Transl. into ENGLISH from Sb. Tr. Inst. Inzh. Zheleznodorozhnogo Transp. (Leningrad), no. 293, 1969 p 29-38
(AD-750969; FTD-MT-24-46-72) Avail: NTIS CSCL 09/1

In this article results are presented from a theoretical analysis of the distribution of pulse voltage over a circuit of series-connected gates of the type VK2-200 which do not have shielding elements. A comparison of the results of the calculation and test data is carried out. GRA

N73-15261# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
COMBINED OPTIMIZATION OF THE ELECTRICAL AND STRUCTURAL PARAMETERS OF AN INTEGRATED CIRCUIT
E. I. Belyaev 7 Aug. 1972 22 p refs Transl. into ENGLISH from Mikroelektronika (USSR), no. 3, 1969 p 267-281
(AD-750947; FTD-HT-23-261-72) Avail: NTIS CSCL 09/5

Integrated circuits can be optimized by the conditional extremum method, because the electrical parameters and permissible modes of the components are continuous functions of the parameters of the technological process. It is advisable to use the parameters of the technological process as input (primary) parameters. The boundary of the region of valid integrated circuits is calculated in their space (further serving as the condition of optimization) and it is assigned in the form of the function of the criterion of optimization (productivity, cost, dimensions). GRA

N73-15262# Stanford Univ., Calif. Microwave Lab.
ACOUSTIC SURFACE WAVE RESEARCH Semiannual Report, 1 Sep. 1971 - 31 Mar. 1972
M. Chodorow, H. J. Shaw, G. S. Kino, L. A. Coldren, and W. R. Shreve May 1972 48 p refs
(Contract DAAB07-71-C-0145)
(AD-750612; ML-2090; ECOM-0145-2; SAR-2) Avail: NTIS CSCL 09/1

Waveguiding has been observed at 50 MHz in a thin silver strip of 15 mil width vacuum deposited on a bismuth germanium oxide substrate and operating as an electric-field shorting guide. Waveguiding is demonstrated by the elimination of diffraction loss. Waveguiding was also demonstrated in an indium antimonide thin film surface wave amplifier, using a film width of 1 mil operating as an electric-field shorting guide at 340 MHz. This amplifier is suitable for use together with metal film guides of the above type. Wrap-around metal film guides will be constructed to measure propagation loss in these guides, for experimental evaluation of the prospects for using the amplifiers for compensating propagation loss in waveguide systems for very long time delay. A 20 microsecond balanced phase delay line was demonstrated in which the 6 db bi-directional insertion loss of ordinary two-port delay lines was eliminated. Author (GRA)

N73-15263# Rhode Island Univ., Kingston. Dept. of Electrical Engineering.
INTERACTIVE MINIMAX DESIGN OF NONRECURSIVE DIGITAL FILTERS Final Technical Report
Donald W. Tufts, James T. Lewis, and Harlan S. Hersey 16 Oct. 1972 52 p refs
(Contract N00014-68-A-0215-0006)
(AD-750767; URI-EE-4044/1) Avail: NTIS CSCL 09/5

The problem of finding a minimax approximation to an ideal frequency response of a nonrecursive digital filter is studied. The general Remes exchange algorithm for computing the approximation has been implemented using a computer graphics display. Dependence of sidelobe level on the transition band width is considered. In order to obtain a tighter fit in certain regions the techniques of approximation with restricted range are used to compute an approximation which is constrained to lie between two restraining curves. Error trade-off between unconstrained and constrained approximations is considered. A careful mathematical study of discretization error is made. A comparison is made between the authors: approach using restraining curves and the approaches of other investigators in this area. Author (GRA)

N73-15264# Illinois Univ., Urbana. Dept. of Electrical Engineering.
ANALYSIS OF DISCONTINUITIES AND COUPLING PHENOMENA IN MICROSTRIP LINES
Yahya Rahmat-Samii and Tatsuo Itah Sep. 1972 91 p refs (Grants DA-ARO(D)-31-124-71-G77; NSF GK-25074)
(AD-750737; UILU-ENG-72-2549; AROD-5405-33-E) Avail: NTIS CSCL 09/5

An attempt is made to develop an analytical method for investigating the discontinuities and coupling phenomena in microstrip lines under the quasi-TEM approximation. Fourier domain analysis along with Galerkin's method are employed for formulating the problem. Lumped circuit representation is used to show the effect of discontinuity in the microstrip structure. The degree of success that has been achieved in this investigation has been tested by applying the present method to several representative problems, e.g., coupled pairs of microstrip transmission lines, abruptly ended microstrip line, gap in microstrip lines etc. The result obtained by the use of Fourier and Galerkin techniques have been found quite encouraging. Author (GRA)

N73-15265# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MULTILAYERED PRINTED-CIRCUIT ASSEMBLY
N. N. Ushakov 9 Aug. 1972 17 p refs Transl. into ENGLISH from the publ. "Entsiklopediya Izmerenii Kontrolya i Avtomatizatsii (EMMA), No. 14" USSR, 1970 p 11-14
(AD-750918; FTD-HT-23-250-72) Avail: NTIS CSCL 09/5

Microminiaturization cuts cost, size, and weight in electronic equipment, but all types of microminiaturization have their individual difficulties. This augments to the point where the volume of conductors to be connected almost becomes as large as the equipment. This resulted in the use of p-c boards, which can be made in many ways, a few of which are described in the report. Author (GRA)

N73-15668 Joint Publications Research Service, Arlington, Va.
SELECTION OF PARAMETERS OF AN ELECTROMAGNETIC LOAD CELL OPERATING ON DC
P. G. Slomyanskiy *In its* Inertial Guidance Equipment 12 Dec. 1972 p 18-22 refs (For availability see N73-15664 06-21)

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N73-15266*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE OF A 12-COIL SUPERCONDUCTING BUMPY TORUS MAGNET FACILITY
J. Reece Roth, A. David Holmes, Thomas A. Keller, and Walter M. Krawczonek 1972 37 p refs Presented at Tex. Symp. on the Technol. of Controlled Thermonucl. Fusion Expt. and the Eng. Aspects of Fusion Reactors, Austin, Tex., 20-22 Nov. 1972
(NASA-TM-X-68165; E-7225) Avail: NTIS HC $4.00 CSCL 14B

The bumpy torus facility consists of 12 superconducting coils, each 19 cm i.d. and capable of 3.0 teslas on their axes. The coils are equally spaced around a toroidal array with a major diameter of 1.52 m, and are mounted with the major axis of the torus vertical in a single vacuum tank 2.6 m in diameter. Final shakedown tests of the facility mapped out its magnetic, cryogenic, vacuum, mechanical, and electrical performance. The facility is now ready for use as a plasma physics research facility. A maximum magnetic field on the magnetic axis of 3.23 teslas was held for a period of more than sixty minutes without a coil normalcy. The design field was 3.00 teslas. The steady-state liquid helium boil-off rate was 87 liters per hour of liquid helium without the coils charged. The coil array was stable when subjected to an impulsive loading, even with the magnets fully charged. When the coils were charged to a maximum magnetic field of 3.35 teslas, the system was driven normal without damage. Author

N73-15267# Joint Publications Research Service, Arlington, Va.
COLD FOG DISPERSAL OPERATIONS AT ORLY AIRPORT, PARIS, FRANCE, WINTER 1970 - 1971 Final Report
R. Fabre Nov. 1972 41 p Transl. into ENGLISH from report from Paris Airport Authority, Equipment Dept., Orly Airport, Paris Sponsored by FAA
(FAA-RD-72-123) Avail: NTIS HC $4.25

Performance tests of a ground based fog dispersal system at Orly Airport, Paris, France are discussed. The effect on runway visual range improvement and the effectiveness of the fog dispersal operation are described. A cost effectiveness analysis showed that the propane fog dispersal installation benefits the airlines, airport, and passengers. Author

N73-15268# Naval Air Test Facility, Lakehurst, N.J.
ARRESTING-GEAR TESTS FOR ELEVATED SHORT TAKE-OFF AND LANDING PORTS Final Report
Anthony Zagarella and Daniel Spalluto Nov. 1972 16 p (Contract DOT-FA72WAI-247)
(NATF-R125; FAA-RD-72-140) Avail: NTIS HC $3.00

Tests were conducted with an S-2A aircraft and the M-14B-2C arresting gear to determine the degree of angular displacement and the maximum off-center engagements that still allowed the aircraft to remain on the 300 foot wide by 2000 foot long surface of a short takeoff and landing area. Diagrams of the runway conditions and the allowable operating envelopes are presented. Author

N73-15269# National Aerospace Lab., Tokyo (Japan). Aero-engine Div.
ON THE HIGH TEMPERATURE TURBINE TEST FACILITIES AND THE DATA PROCESSING SYSTEM
Jun. 1972 50 p refs In JAPANESE; ENGLISH summary
(NAL-TR-282) Avail: NTIS HC $4.50

The development and operation of a high temperature turbine test facility are discussed. The use of the facility for conducting experiments on the aerodynamic and thermodynamic performance of air cooled, axial flow turbines is reported. Details of the data processing system of the test facility are included. Author

N73-15270# Defence Research Establishment Valcartier (Quebec).
PRESSURE TRANSDUCER MEASUREMENTS IN FULL-SCALE MODEL OF PROPOSED SHOCK ATTENUATION TREATMENTS FOR DREV BALLISTIC RANGES
B. Podesto Nov. 1972 24 p refs
(Proj. 95-51-10)
(DREV-TN-2031/72) Avail: NTIS HC $3.25

Pressure transducer measurements were carried out to measure the relative efficiency of a full-scale fiber glass wedge treatment and a full-scale parabolic deflector treatment for attenuating shock waves in the vicinity of various wake probes. The fiber glass wedge treatment appears to offer very good attenuation of the outgoing bow shock waves from hypersonic projectiles, no reflected shock waves were detected from pressure transducers installed in sections of the range lined with this treatment. The parabolic deflector treatment was found to be inadequate because of the limited attenuation that it provided, and because of the restricted size of the zone where maximum attenuation was obtained. Author

N73-15271# Defence Research Establishment Valcartier (Quebec).
DESIGN AND EVALUATION OF A SHAPED CHARGE SPINNING APPARATUS FOR JET DISPERSION STUDIES
G. E. Booker and J. M. Jones Oct. 1972 14 p ref
(Proj. 97-01-19)
(DREV-TN-2037/72) Avail: NTIS HC $3.00

Test equipment developed to investigate the effect of spin on the behavior of shaped charges is described. The equipment allows for a safe laboratory simulation of a spin stabilized warhead at rotational speeds up to 21,000 rpm. Data are

presented on the effect of spin rate on the penetration of massive jet shaped charges. Author

N73-15272*# Physics International Co., San Leandro, Calif.
DEVELOPMENT OF EXPLOSIVELY DRIVEN LAUNCHER FOR METEOROID STUDIES
Dennis W. Baum Washington NASA Jan. 1973 57 p refs (Contract NAS2-5860)
(NASA-CR-2143) Avail: NTIS HC $3.00 CSCL 22D

The results of a continuing program to develop an explosively driven 2-stage hypervelocity launcher capable of achieving velocities between 15 and 20 km/sec are described. Previous efforts had identified incomplete barrel collapse as a limiting factor in launcher performance. Correlation of experimental and computational results obtained in the present study indicate that boundary-layer gases within the barrel act to prevent complete closure. Simplified calculations suggest that in-contact explosives may have insufficient energy densities to collapse the barrel against a developed boundary layer. Higher energy densities, sufficient to produce complete closure, were obtained with the use of steel flyer plates accelerated by a phased explosive lens. However, when flat flyer plates were impacted on the barrel, the sides of the barrel were observed to rupture and leak gas prior to barrel closure. A promising solution to this problem (untested) is to produce a symmetrical collapse with a cylindrical tube around the barrel. Author

N73-15273# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Material und Festkoerperforschung.
CONCEPT OF AN IRRADIATION FACILITY FOR INVESTIGATION OF HIGH-TEMPERATURE THERMO-ELEMENTS AT TEMPERATURES TO 2000 C
D. Piel Mar. 1972 29 p refs In GERMAN; ENGLISH summary
(KFK-1556) Avail: AEC Depository Libraries

In addition to general indications with respect to W/Re thermocouples and the aims pursued in a high-temperature irradiation program an irradiation rig is described. This rig may be used to investigate the behavior of high-temperature thermocouples in the radiation field of a reactor, using a gas thermometer. The most important instability effects of thermocouples are discussed and given as experimental parameters. The irradiation capsule was designed for insertion into the Br2 Reactor at Mol and for temperatures of about 2000 C. The individual heat transport mechanisms are described which underlie the calculation of temperature distribution. Author (NSA)

N73-15274# Daresbury Nuclear Physics Lab. (England).
DETAILED DESIGN STUDY FOR THE NINA BOOSTER, VOLUME 2
1972 154 p refs
(DNPL/R-13(Vol-2)) Avail: AEC Depository Libraries

The report is presented in eight chapters; assessment of the program MAGNET and its application to the design of synchrotron magnets; lattice and orbit calculations for the booster; design of the magnet power supplies for the booster; comparison of standing wave and travelling wave structures for acceleration in the booster; beam trajectories and tolerances for a six turn extraction system from NINA; targeting, beam extraction, and beam lines for the booster; experimental utilisation of the booster; and survey requirements for the booster. NSA

N73-15275# California Univ., Livermore. Lawrence Livermore Lab.
GEOGRAPHICAL VARIATIONS IN ENVIRONMENTAL RADIATION BACKGROUND IN THE UNITED STATES
C. L. Lindeken, K. R. Peterson, D. E. Jones, and R. E. McMillen 24 Mar. 1972 30 p refs Presented at the 2d Conf. on Nat. Radiation Environments, Houston, Tex., 7-11 Aug. 1972
(UCRL-73822; Conf-720805-1) Avail: NTIS

Simultaneous measurements of environmental radiation background at 107 weather stations throughout the United States were made using CaF2:Dy thermoluminescent dosimeters. Light output is proportional to the radiation dose received by the phosphor from the sum of terrestrial and cosmic sources. The cosmic component was estimated from the elevation and geomagnetic latitude of the station, and terrestrial radiation was obtained by difference. Median environment radiation exposure rate was 9.4 micro R/hr with a range from 3.7 to 19.9 micro R/hr. The median terrestrial exposure rate was 5.5 micro R/hr. Low backgrounds were found in the Hawaiian Islands, Northern Alaska, and Florida. High backgrounds in the Rocky Mountain States are due more to higher terrestrial radiation than to increased cosmic radiation. Author (NSA)

N73-15276# National Standards Lab., Sydney (Australia).
[MEASUREMENT STANDARDS FOR USE IN PHYSICS] Biennial Report, 1969 - 1971
1971 92 p refs
(NP-19392) Avail: AEC Depository Libraries

Maintenance of standards of measurement in the fields of thermometry, photometry and radiometry, viscometry and hygrometry as well as the standards of length, mass, time interval and associated quantities, electrical quantities and optical quantities is described. Development and progress in research in solar physics, molecular physics, airglow and aurora, and theoretical astrophysics are reviewed. NSA

N73-15277# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany). Inst. fuer Raumsimulation.
A PROPOSAL FOR COMPARATIVE MEASUREMENTS IN SPACE CHAMBERS [EIN VORSCHLAG FUER VERGLEICHENDE MESSUNGEN AN RAUMKAMMERN]
Willi Hallmann Apr. 1971 46 p refs In GERMAN; ENGLISH summary
(DLR-FB-71-44) Avail: NTIS HC $4.50; DFVLR, Porz, West Ger. 14,60 DM

The thermal behavior was investigated of a model built in triplicate and tested in three different space simulation chambers of approximately the same size under identical conditions, in order to compare the thermal reliability of the space chambers. The design of the model takes into account the different sources of light - parallel and divergent radiation. The result of the study shows that the temperature deviations measured on the models had unexpectedly high values. Author (ESRO)

N73-15278# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung Gasdynamik.
TEST FACILITIES OF THE DFVLR IN THE TRANSONIC AND HYPERSONIC SPEED RANGE AND MAIN ACTIVITIES
W. Lorenz-Meyer Nov. 1971 26 p refs Presented at the 36th Semiann. Meeting of the Supersonic Tunnel Assoc., Huntsville, Ala., 7-8 Oct. 1971
(DLR-FB-71-86; AVA-FB-7151) Avail: NTIS HC $3.50; DFVLR, Porz, West Ger. 8,40 DM

A survey of the efforts to rebuild efficient wind tunnel facilities in Germany after World War II is given. The transonic and hypersonic tunnels built under the wind tunnel program of the government of the Federal Republic of Germany are described in detail. The main activities carried out in these tunnels, i.e., re-entry vehicles, slender bodies, and free-flight testing, are presented. Author (ESRO)

N73-15279# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung Raumfahrtaerodynamik.
DESIGN AND SYSTEM DESCRIPTION OF THE THIRD TEST SECTION OF THE DFVLR (AVA) HYPERSONIC LOW DENSITY FACILITY AT GOETTINGEN [ENTWURFSGRUNDLAGEN UND KURZE BAUBESCHREIBUNG DER DRITTEN MESSTRECKE DES HYPERSONISCHEN WINDKANALS FUER KLEINE GASDICHTEN DER DFVLR (AVA) IN GOETTINGEN]
H. Legge Sep. 1971 95 p refs In GERMAN; ENGLISH summary
(DLR-FB-71-84; AVA-FB-7101) Avail: NTIS HC $6.75; DFVLR, Porz, West Ger. 30 DM

Fundamental design considerations for the third test section of the DFVLR (AVA) low density facility at Goettingen are dealt with. The possible nozzle size is discussed for a given pumping capacity and the supersonic free jet is described as regards production of high Mach number and low density flow fields. Future use of the facility for the generation of molecular beams is discussed. The entire system is described and the limits of

operation are estimated for free jet expansions from room temperature conditions. Author (ESRO)

N73-15280# Deutsche Gesellschaft fuer Luft- und Raumfahrt, Cologne (West Germany). Arbeitsgemeinschaft Deutscher Verkehrsflughaefen.

TODAY'S TRAFFIC LANDING SITES [DIE VERKEHRSLANDEPLAETZE HEUTE]

Kurt Siebenwurst 1972 18 p In GERMAN Presented at the DGLR Symp. on Flugbetrieb, Cologne, 15 Sep. 1972

(DGLR-Paper-72-033) Avail: NTIS HC $3.00

The role of regional airports for irregular air traffic use in Germany is discussed. Special attention is paid to the infrastructural importance of these airports for certain user groups in trade and industry. The construction costs are generally estimated at 5 to 10 million DM, and the annual operation costs at from 30,000 to 300,000 DM. Economics, flight safety, and aircraft noise are also discussed. Author (ESRO)

N73-15281# Deutsche Gesellschaft fuer Luft- und Raumfahrt, Cologne (West Germany).

AIRPORTS TODAY, SIGNIFICANCE AND PROBLEMS OF AIR TRAFFIC [FLUGHAEFEN HEUTE, BEDEUTUNG UND PROBLEME DER FLUGHAEFEN IM HEUTIGEN LUFTVERKEHR]

U. Wolffram 1972 14 p In GERMAN Presented at the DGLR Symp. on Flugbetrieb, Cologne, 15 Sep. 1972

(DGLR-Paper-72-034) Avail: NTIS HC $3.00

The role of airports in the economic infrastructure of Germany is described and planning for future traffic developments is discussed. The influence on airport planning of technological advances, with regard to noise reduction, all weather operation, and STOL/VTOL aircraft, is surveyed. Author (ESRO)

N73-15282# Deutsche Lufthansa Aktiengesellschaft, Cologne (West Germany).

FLIGHT OPERATIONS FROM AN AIRLINE COMPANY'S POINT OF VIEW [FLUGBETRIEB AUS DER SICHT EINER LUFTVERKEHRSGESELLSCHAFT]

Rolf Bebber 1972 21 p In GERMAN Presented at the DGLR Symp. on Flugbetrieb, Cologne, 15 Sep. 1972

(DGLR-Paper-72-037) Avail: NTIS HC $3.25

The experiences of an airline operator with regard to the latest developments in air traffic are described. The basic principles of operation under present conditions, flight safety, passenger comfort, schedule adherence, and economy, are surveyed. It is concluded that technological problems are secondary to the influences of strikes, political unrest, and sabotage, and that flight safety should be increased. Author (ESRO)

N73-15283# European Research Office, London (England).

VISIT TO THE NATIONAL AEROSPACE LABORATORY (NLR), AMSTERDAM, NETHERLANDS, 17 AUGUST 1972 Trip Report

Richard L. Scharpf Oct. 1972 11 p

(AD-750589; ERO-12-72) Avail: NTIS CSCL 14/2

NLR was visited for the purpose of reviewing the status of the simulator effort and receiving a briefing on the future simulator facility. Author (GRA)

N73-15284# ARO, Inc., Arnold Air Force Station, Tenn.

OPTICAL INSTRUMENTATION STUDIES IN AEROSPACE FACILITIES: A PROJECT SUMMARY Final Report, Jul. 1971 - Jun. 1972

Paul H. Dugger AEDC Oct. 1972 43 p refs

(Contract F40600-73-C-0004)

(AD-750866; ARO-VKF-TR-72-105; AEDC-TR-72-141) Avail: NTIS CSCL 14/5

Evaluations and remedial modifications to laser photography systems have resulted in a 30-percent increase in reliability for optimum performance. Another unique modification to the laser photographic technique has added the capability for flow visualization when desired. A 70-percent increase in spatial resolution has resulted from refinements to photopyrometry systems. Investigations of schlieren-related flow visualization techniques resulted in the selection of a focused shadowgraph arrangement for detection of boundary-layer transition on conical models. Preliminary designs for photographic instrumentation systems for use during erosion testing were completed. Author (GRA)

N73-15285# Federal Electric Corp., Vandenberg AFB, Calif.

SPACE AND MISSILE TEST CENTER LANDBASE INSTRUMENTATION HANDBOOK

Apr. 1972 254 p

(Contract F04701-72-C-0102)

(AD-750944; SAMTEC-TR-72-3) Avail: NTIS CSCL 16/1

The Space and Missile Test Center (SAMTEC) landbased instrumentation provides launch support capabilities for purposes of range safety, ballistic missile impact prediction and location, telemetry data acquisition and reduction, and satellite tracking and communications. Installed systems and equipments are used to support missile and space programs originating at Vandenberg AFB, Calif. as well as operational programs originating at other service and national ranges. Principal SAMTEC instrumentation facilities and operational support systems are located in California, Hawaii and downrange sites in the Pacific Ocean Area. Author (GRA)

N73-15286# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.

CAPABILITY OF THE TOTAL IN-FLIGHT SIMULATOR (TIFS) Final Report

Philip A. Reynolds, Richard Wasserman, Gardner J. Fabian, and Paul R. Motyka Feb. 1972 162 p refs

(Contract F33615-71-C-1110; AF Proj. 6848)

(AD-750745; CAL-TB-3020-F-4; AFFDL-TR-72-39) Avail: NTIS CSCL 01/3

TIFS is a newly developed, variable stability C-131 aircraft with the unique capability to vary its flying qualities in all six degrees of freedom. It also surpasses the utility of past variable stability aircraft through the realism possible in its separate, new evaluation cockpit. The capabilities and features of this in-flight simulator considerably broaden the ability of the aircraft designer to deal with difficult trade-offs in flying qualities problems. A base configuration can be set up and then its stability and control characteristics can be systematically varied for investigations to gain research knowledge pertinent to flight vehicle and flight control system design. The report describes the theoretical basis for in-flight motion reproduction and how this theory can be applied to determine the TIFS capability to simulate a given aircraft. Physical characteristics as determined in flight and examples of simulation are given. Flight test records of model-following performance are also included. The objective of the report is to give the reader the basic information for planning a TIFS experiment. Author (GRA)

N73-15287# Wyle Labs., Inc., Huntsville, Ala.

ENVIRONMENTAL IMPACT OF NOISE FROM THE PROPOSED ARNOLD ENGINEERING DEVELOPMENT CENTER (AEDC) HIGH REYNOLDS NUMBER TUNNEL Final Report, 13 Mar. - 30 Jun. 1972

K. J. Plotkin, J. E. Robertson, and J. A. Cockburn Oct. 1972 180 p refs

(Contract F40600-72-C-0007)

(AD-750465; WR-72-7; AEDC-TR-72-151) Avail: NTIS CSCL 14/2

A study to evaluate the environmental impact of the noise produced by a proposed High Reynolds Number Tunnel (HIRT) under consideration at the Arnold Engineering Development Center (AEDC) has been conducted by Wyle Laboratories. During earlier studies, the noise characteristics of the HIRT facility were defined. These studies included (1) theoretical analyses of the noise generation mechanisms associated with the operation of the facility, and (2) scale-model experiments to provide base-line data for extrapolation to full-scale conditions. The assessment of environmental impact, based on the predicted noise environment of the full-scale facility, is the subject of this report. This assessment contains all pertinent data of relevance to the noise impact which may be anticipated during HIRT operation and includes (1) a summary of the Noise Characteristics of HIRT, (2) Specification of Acceptable Noise Limits for people, animals, and buildings which will be exposed to HIRT noise, (3) the Environmental Impact of HIRT noise as evaluated by comparing HIRT noise with acceptable limit criteria, and (4) Special Considerations for Noise Protection and Control. Author (GRA)

N73-15288# ARO, Inc., Arnold Air Force Station, Tenn.
A STUDY OF THE JET STRETCHER CONCEPT FOR ANGLE OF ATTACK TESTING Final Report, 1 Jul. 1970 - 30 Jun. 1971
R. C. Bauer, R. L. Barebo, and E. H. Matkins AEDC Oct. 1972 45 p refs
(Contract F40600-73-C-0004; AF Proj. 3012)
(AD-750867; ARO-ETF-TR-72-103; AEDC-TR-72-150) Avail: NTIS CSCL 14/2

The feasibility of using a porous, axisymmetric jet stretcher for angle-of-attack testing of missiles having aft-located engine inlets was demonstrated. Initially, an analytical technique was developed for evaluating the performance of a jet stretcher and was applied to a small-scale experimental jet stretcher system for test body angles of attack of 4 and 8 deg. For each test body angle of attack the analytical technique was used to determine the optimum position of the jet stretcher and the regions on the jet stretcher that require porosity. Author (GRA)

N73-15289# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METHODS FOR DESIGNING THE ELECTROMAGNET OF A BETATRON ON AN ASSIGNED VALUE OF INTENSITY OF RADIATION
V. P. Belyaev, A. A. Vorobev, V. A. Vorobev, V. I. Gorbunov, and G. A. Kunitsyn 18 Aug. 1972 17 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Elektromekhan. (Novocherkassk), no. 1, 1971 p 38-43
(AD-750523; FTD-HT-23-366-72) Avail: NTIS CSCL 20/7

A method of calculation is proposed, using a computer, which makes it possible to plan betatrons with assigned values of individual parameters and an optimum combination of all the remaining characteristics of the installation in the energy range of accelerated electrons of 5-50 MeV. This range of energies of accelerated electrons includes practically all the possible cases of use of betatrons which are of practical interest.
Author (GRA)

N73-15290# Peat, Marwick, Mitchell and Co., San Francisco, Calif.
HIGH SPEED GROUND ACCESS STUDY, LOS ANGELES INTERNATIONAL AIRPORT
Apr. 1972 87 p refs Prepared for Los Angeles City Dept. of Airports
(Contract DOT-UT-312)
(PB-212023; UMTA-CA-09-0010-72-1) Avail: NTIS HC $3.00 CSCL 13F

A review of the projected ridership, construction costs, operating costs and resultant financial analysis relative to the proposed high speed ground access system between Los Angeles International Airport and San Fernando Valley is reported. The system is composed of a tracked air cushion vehicle system and an intra-airport system that interface. The intra-airport system is either an intra-airport transit system or a bus system. The report studies the three alternative high speed ground access systems: A 16 mile TACV/IAT System, a 16 mile TACV/Bus System, and an 8 mile TACV/Bus System. Author (GRA)

N73-15966 Joint Publications Research Service, Arlington, Va.
ROLE, ACTIVITIES OF NATIONAL BUREAU OF METROLOGY DEFINED
Tibor Pataky *In its* Transl. on Eastern Europe: Sci. Affairs, No. 290 18 Dec. 1972 p 1-12 Transl. into ENGLISH from Finomechanika (Budapest), v. 11, no. 10, 1972 p 296-303 (For availability see N73-15965 06-34)

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N73-15291*# Stanford Univ., Calif. Thermosciences Div.
THE TURBULENT BOUNDARY LAYER ON A POROUS PLATE: AN EXPERIMENTAL STUDY OF THE HEAT TRANSFER BEHAVIOR WITH ADVERSE PRESSURE GRADIENTS
B. F. Blackwell, W. M. Kays, and R. J. Moffat Aug. 1972 158 p refs
(Grant NGL-05-020-134)
(NASA-CR-130291; SU-HMT-16) Avail: NTIS HC$10.00 CSCL 20D

An experimental investigation of the heat transfer behavior of the near equilibrium transpired turbulent boundary layer with adverse pressure gradient has been carried out. Stanton numbers were measured by an energy balance on electrically heated plates that form the bottom wall of the wind tunnel. Two adverse pressure gradients were studied. Two types of transpiration boundary conditions were investigated. The concept of an equilibrium thermal boundary layer was introduced. It was found that Stanton number as a function of enthalpy thickness Reynolds number is essentially unaffected by adverse pressure gradient with no transpiration. Shear stress, heat flux, and turbulent Prandtl number profiles were computed from mean temperature and velocity profiles. It was concluded that the turbulent Prandtl number is greater than unity in near the wall and decreases continuously to approximately 0.5 at the free stream. Author

N73-15292# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
THE EFFECT OF NONEQUILIBRIUM EFFECTS ON THE MEASUREMENT OF FLOW PROPERTIES IN THE LONG-SHOT HYPERSONIC TUNNEL
Edgard Backx Oct. 1972 45 p refs
(VKI-TN-83) Avail: NTIS $4.25

An estimation of vibrational frozen temperatures in the testing region for the range of running conditions used in the von Karman Institue Longshot hypersonic wind tunnel is presented. To assess the extent of the nonequilibrium effects caused by the vibrational freezing, the static temperature and pressure variation along the nozzle are calculated. An approximate method has been developed to find the influence of vibrational relaxation on the temperature and pressure along the stagnation line between a bow shock and a body. This has been done to determine the errors involved in calculating test section conditions in which the flow is assumed to be in equilibrium and to aid selection of an appropriate technique of measuring stagnation temperature required to study the nozzle wall turbulent boundary layer in the Longshot tunnel. Author

N73-15293# Joint Publications Research Service, Arlington, Va.
STATIONARY MOTION CONFIGURATIONS OF A FILAMENT
20 Dec. 1972 14 p refs Transl. into ENGLISH from Prikl. Mekh. (Kiev), v. 2, no. 6, 1966 p 133-136 and v. 8, no. 4, 1972 p 100-104
(JPRS-57813) Avail: NTIS HC $3.00

The critical velocity and patterns of stationary motion of a filament are considered. The effects of gravitational and resistance forces to longitudinal motion are also included. For individual titles, see N73-15294 through N73-15295.

N73-15294 Joint Publications Research Service, Arlington, Va.
DETERMINING A FILAMENT'S STATIONARY MOTION PATTERNS IN MEDIA OF DIVERSE VISCOSITIES
V. A. Svetlitskiy, R. A. Miroshnik, and V. I. Kurkin *In its* Stationary Motion Configurations of a Filament 20 Dec. 1972 p 1-7 refs (For availability see N73-15293 06-12)

A stationary motion pattern is considered in media of different viscosities allowing for gravitational and resistance forces to longitudinal motion. These motions are encountered in ribbon and flexible antennas. Cartesian and Euler arc coordinates are used, along with equations of motion. J.A.M.

N73-15295 Joint Publications Research Service, Arlington, Va.
ON THE CRITICAL VELOCITY OF STATION MOTION
V. A. Svetlitskiy and V. I. Gabryuk *In its* Stationary Motion Configurations of a Filament 20 Dec. 1972 p 8-17 refs (For availability see N73-15293 06-12)

Conditions of stationary motion existence are studied by a closed loop filament in a viscous medium. Using a boundary value problem, the critical value of the velocity of longitudinal filament motion is established. The results of experimental studies

of the critical velocities are shown. Differential equations are used for stationary filament motion in the Cartesian system XOY, with the Y-axis extending in the direction of the gravity field.
J.A.M.

N73-15296# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.
AN INTEGRAL METHOD FOR PREDICTION OF INCOMPRESSIBLE PLANE TURBULENT WAKES
A. Prabhu Sep. 1972 21 p ref
(Rept-72-FM-5) Avail: NTIS HC $3.25

A simple momentum integral type method is described for solving a relaxation-diffusion model for the turbulent shear stress together with the equations of mass and momentum. Calculations based on this method show excellent agreement with exact numerical solutions as well as with the experimental results on the development of wakes subjected to a variety of pressure gradients. Author

N73-15297# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.
NOTES ON THE EXPERIMENTAL DATA ON REVERTING BOUNDARY LAYERS
K. R. Sreenivasan Sep. 1972 26 p refs
(Rept-72-FM-2) Avail: NTIS HC $3.50

An analysis of the mechanism underlying turbulent boundary layers undergoing reversion to laminar flow is presented. Experiments to reexamine inconsistencies in data on the mean flow quantities are explained. Data obtained from the experiments are produced in the form of tables and graphs. Author

N73-15298# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.
RAPID DISTORTION OF AXISYMMETRIC TURBULENCE
K. R. Sreenivasan Sep. 1972 32 p refs
(Rept-72-FM-7) Avail: NTIS HC $3.75

For a special but nontrivial case of homogeneous and initially axisymmetric turbulence, the change in component energies due to a sudden but otherwise arbitrary three-dimensional distortion is found in closed form. Some special cases are discussed. Comparison with selected experimental data reveals a few interesting and encouraging features. Author

N73-15299# National Aeronautical Lab., Bangalore (India).
NUMERICAL EVALUATION OF TRANSONIC WAVE DRAG INTEGRAL USING CUBIC SPLINES
V. V. Shanbhag Sep. 1971 12 p refs
(NAL-TN-35) Avail: NTIS HC $3.00

A comparison was made of results from three methods used to evaluate the transonic wave drag integral. The methods used were: (1) close form evaluation of the integral, (2) integrate once in close form then integrate using Romberg procedure, and (3) Gaussian type integration for first integration and Romberg procedure for second integration. The results indicate that the first method takes considerably less time compared to the other two and gives better results when area distribution was at sufficient number of points. The derivatives were calculated by cubic spline approximation. Author

N73-15300# Universite Scientifique et Medicale de Grenoble (France).
EFFECT OF SOLID SUSPENDED PARTICLES IN MODIFYING TURBULENCE CHARACTERISTICS Ph.D. Thesis [MODIFICATION DES CARACTERISTIQUES D'UNE TURBULENCE SOUS L'INFLUENCE DE PARTICULES SOLIDES EN SUSPENSION]
Slobodan Petkovic 18 Apr. 1972 122 p refs In FRENCH
Avail: NTIS HC $8.25

An experimental study was made of the modifications to turbulence made by solid materials in suspension. Data cover influence of particle concentration and motion on flow velocity and degree of turbulence. Procedures and instruments used to study this phenomenon are included. Transl. by E.H.W.

N73-15301# Universite Scientifique et Medicale de Grenoble (France).
JET FLOW IN A ROTATING FLUID WITH ELEVATED INTENSITY Ph.D. Thesis [SUR L'ECOULEMENT D'UN JET DANS UN FLUIDE EN ROTATION D'INTENSITE ELEVEE]
V. Bankole Martins 17 Feb. 1972 235 p refs In FRENCH
Avail: NTIS HC $13.75

Equations are presented for analyzing the hypothesis, similitude parameters, and anterior jet flow in a rotating fluid. Experimental equipment, measuring techniques, and flow visualization are included. Special attention was given to non-rotating and rotating jets placed in the axis of the rotating fluid. For the two jets, measurements were made of mean velocity and pressure at various sections of the conduit, jet periodicity, and the influence of initial rotation on the frequency of jet oscillation. The general structure of fluid trajectories was also determined. Transl. by E.H.W.

N73-15302# Universite Scientifique et Medicale de Grenoble (France).
SOME ASPECTS OF MOLECULAR DIFFUSION IN ROTATING FLOWS. POSSIBLE APPLICATION TO ISOTOPE SEPARATION BY FIXED WALL CENTRIFUGATION Ph.D. Thesis [QUELQUES ASPECTS DE LA DIFFUSION MOLECULAIRE DANS LES ECOULEMENTS TOURNANTS. APPLICATION EVENTUELLE A LA SEPARATION ISOTOPIQUE PAR CENTRIFUGATION EN PAROIS FIXES]
Jean-Claude Guilloud 29 Apr. 1971 285 p refs In FRENCH
Avail: NTIS HC $16.25

A study, relative to the separation of a gaseous binary flow by fixed wall centrifugation, is presented. Fundamental equations of molecular turbulent diffusion and separation are presented for the gaseous phase. The possible application of this method to industrial separation of uranium isotopes was also investigated as well as electromagnetic separation. Transl. by E.H.W.

N73-15303# Universite Scientifique et Medicale de Grenoble (France).
MEASUREMENT OF FREE SURFACE GEOMETRIC FLUCTUATIONS Ph.D. Thesis [MESURE DES FLUCTUATIONS GEOMETRIQUES DE SURFACE LIBRE]
Christian Hussenot-Desenonges 20 Jan. 1972 119 p refs In FRENCH
Avail: NTIS HC $8.00

A description is given of the apparatus used to detect fluctuations in free surface flow along with the conditions responsible for these fluctuations. Parameters considered include fluid properties, viscosity, mass volume, and superficial tension.
Transl. by E.H.W.

N73-15304# Research Inst. of National Defence, Stockholm (Sweden).
BASIS FOR CALCULATING EFFECTS OF AIR RESISTANCE TO H5 SHRAPNEL
Bo Janzon May 1971 84 p refs In SWEDISH
(FOA-2-A-2539-44) Avail: NTIS HC $6.25

A study of literature and a collection of existing information at home and abroad concerning air resistance mainly to fragmented shrapnel of different shapes are presented. Simple recommendations suitable for computer and rough estimates connected with measurements of effects are provided. The methods for the experimental determination of air resistance are briefly mentioned and in conclusion some simple sample calculations are given. A nomogram for quick estimation of air resistance is included.
Author

N73-15305# Research Inst. of National Defence, Stockholm (Sweden).
SFIN COMPUTER PROGRAM FOR CALCULATION OF TIME-DEPENDENT FLOW IN UNI-DIMENSIONAL SYMMETRY OF VARIOUS MATERIALS UNDER DIFFERENT CONDITIONS
Ake Nylander May 1971 57 p refs In SWEDISH
(FOA-2-C-2471-25) Avail: NTIS HC $5.00

A computer program for the calculation of influx towards the center of a spherical symmetrical metal shell, when accelerated by detonation of a spherical symmetrically placed explosive substance is presented. This is a problem in time dependent hydrodynamics for a one-dimensional space. In addition to the basic hydrodynamic equations in differential form, the following environmental conditions are introduced into the program: (1) the equation for a polytropic gas (for the explosive material

reaction products) and (2) the relationships for the metal. Burst models for the metal are included. The method for solving the hydrodynamic equations is that given by van Neumann and shockwaves are treated according to the q method. Author

N73-15306# Research Inst. of National Defence, Stockholm (Sweden).
DIFFUSION WITH CYLINDRICAL SYMMETRY
Bertel Laurent Jun. 1971 19 p In SWEDISH
(FOA-1-C-1409-92) Avail: NTIS HC $3.00

The solution of the diffusion problem is well known, both in the linear as well as in the cylindrical symmetrical case. The derivations of these solutions are briefly reproduced here with boundary and initial conditions which are adapted to special diffusion experiments, namely the cylindrical symmetrical case, where it is a question of diffusion towards the center. A detailed numerical treatment is made. Finally the cylindrical symmetrical solution is discussed for very small values of time. The result is a $t^{1}/4$ law for the concentration at the center. Author

N73-15307*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF A STUDY OF MACH NUMBER AND REYNOLDS NUMBER EFFECTS ON THE LEE SIDE VORTEX FLOW FIELD CHARACTERISTICS OF AN OGIVE-CYLINDER-FRUSTUM-CYLINDER AT ANGLES OF ATTACK TO 25 DEGREES, VOLUME 1
J. E. Foley 31 Oct. 1972 110 p refs 2 Vol.
(Contract NAS8-24391)
(NASA-CR-123997-Vol-1; TN-AP-72-565-Vol-1) Avail: NTIS HC $7.50 CSCL 20D

An experimental program was conducted to survey the lee side vortex flow field about an ogive-cylinder-frustum-cylinder at angles of attack to 25 degrees for two Reynolds numbers at Mach number 0.8, and one Reynolds number at Mach number 1.96. The data were obtained using miniature 5-port conical pressure probes calibrated for angle of attack and roll angle over a Mach number range of 0.6 to 3.0. The results are presented here as local flow field properties and circulation strengths for various body stations. Author

N73-15308*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF A STUDY OF MACH NUMBER AND REYNOLDS NUMBER EFFECTS ON THE LEE SIDE VORTEX FLOW FIELD CHARACTERISTICS OF AN OGIVE-CYLINDER-FRUSTUM-CYLINDER AT ANGLES OF ATTACK TO 25 DEGREES. VOLUME 2: APPENDIX
J. E. Foley 31 Oct. 1972 392 p 2 Vol.
(Contract NAS8-24391)
(NASA-CR-123997-Vol-2; TN-AP-72-565-Vol-2) Avail: NTIS HC $21.75 CSCL 20D

A listing of the data reduction computer program output for the analysis of the lee side vortex flow about an ogive-cylinder-frustum-cylinder is presented. A computed local flow property for the flow field location array at a specific body station and freestream condition is listed. Significant local flow properties are computed. The local circulation strengths in the radial and circumferential directions are analyzed. Author

N73-15309*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TABLES OF CRITICAL-FLOW FUNCTIONS AND THERMODYNAMIC PROPERTIES FOR METHANE AND COMPUTATIONAL PROCEDURES FOR BOTH METHANE AND NATURAL GAS
Robert C. Johnson Washington 1972 73 p
(NASA-SP-3074) Avail: NTIS HC $3.00 CSCL 20D

Procedures for calculating the mass flow rate of methane and natural gas through nozzles are given, along with the FORTRAN 4 subroutines used to make these calculations. Three sets of independent variables are permitted in these routines. In addition to the plenum pressure and temperature, the third independent variable is either nozzle exit pressure, Mach number, or temperature. A critical-flow factor that becomes a convenient means for determining the mass flow rate of methane through critical-flow nozzles is tabulated. Other tables are included for nozzle throat velocity and critical pressure, density, and temperature ratios, along with some thermodynamic properties of methane, including compressibility factor, enthalpy, entropy, specific heat, specific-heat ratio, and speed of sound. These tabulations cover a temperature range from 120 to 600 K and pressures to 3 million N/sq m. Author

N73-15310# Joint Publications Research Service, Arlington, Va.
FORMATION OF AN INVERSION IN A CO2-H2O-N2 GAS MIXTURE JET EXPANDING THROUGH A SLIT
Ye. M. Kudryavtsev and V. N. Fayzulayev 4 Jan. 1973 17 p refs Transl. into ENGLISH of Lab. of Low-Temp. Plasma Optics, Moscow, Preprint No. 68, 1972 29 p
(JPRS-57906) Avail: NTIS HC $3.00

The relaxation kinetics calculated for a CO2-H2O-N2 mixture with consideration of the gas dynamics of escape from a slit-nozzle with an angle of opening of 60 degrees are discussed. The application of the data to optimizing the operation of gas dynamic lasers is described. The physical properties of the mixture under various conditions of temperature and pressure are shown as graphs. Author

N73-15311*# Scientific Translation Service, Santa Barbara, Calif.
THE BEHAVIOR OF PARALLEL AIR JETS
J. G. EdlerVonBohl Washington NASA Jan. 1973 34 p refs Transl. into ENGLISH from Ing.-arch. (West Germany), v. 11, 1940 p 295-314
(Contract NASw-2483)
(NASA-TT-F-14653) Avail: NTIS HC $3.75

The flow behind three grids having different opening sizes was studied to explain irregularities in the flow behind smoothing grids. A probe which could be calibrated in a free jet mixing zone was developed. For the grids studied it appears that the instability observed occurs more easily as lattice rods of constant width are placed closer together. This phenomenon was followed up theoretically. Author

N73-15312# National Research Council of Canada, Ottawa (Ontario).
OPTICAL MEASUREMENT OF LOCAL VELOCITIES IN FLOWS
A. Mueller 1972 14 p refs Transl. into ENGLISH from Schweiz. Bauz (Zurich), v. 88, no. 43, 1970 p 971-975
(NRC-TT-1592) Avail: NTIS HC $3.00

By measuring the Doppler shift of laser light scattered in a flowing medium it is possible to make an optical measurement of the flow velocity. The principle of measurement and how the method of measurement is put to use in an instrument are explained. The method is compared with known methods of measuring local flow velocities. Author

N73-15313*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Aerospace Engineering Dept.
AN EXPERIMENTAL STUDY OF SLOT INJECTION INTO A SUPERSONIC STREAM
Michael Kenworthy and Joseph A. Schetz Washington NASA Jan. 1973 41 p refs
(Grant NGR-47-004-072)
(NASA-CR-2128) Avail: NTIS HC $3.00 CSCL 20D

An experimental investigation of two-dimensional tangential-slot injection into a turbulent boundary layer at a freestream Mach number of 2.4 has been conducted. Nearly adiabatic surface temperatures were maintained during all tests. Static and pitot pressure profiles at four stations downstream of the slot were obtained. Skin friction was measured at the last three stations with a self-nulling balance. Schlieren photographs of the flow field were also obtained. Most of the data were obtained with slot Mach numbers of 0.31 and 0.66 corresponding to slot pressure less than and equal to stream static pressure, respectively. For the latter matched-pressure case, tangential slot injection reduced the surface shear at the three measuring stations by about 60 to 20 percent for increasing downstream distances from the slot of 12 to 28 slot heights. However, for the other case where slot pressure was less than stream static pressure, the effect of injection was to increase the shear by about 90 percent at the last downstream station of 28 slot heights. This increase in shear is attributed to the rapid acceleration of the low speed injectant stream by the high speed main stream and the increasing pressure through the recompression zone which is absent for the matched pressure case. Author

N73-15314# Los Alamos Scientific Lab., N.Mex.
TURBULENCE TRANSITIONS IN CONVECTIVE FLOW
Bart J. Daly 1972 8 p refs Presented at the 3d Intern. Conf. on Numerical Methods in Fluid Dyn., Paris, 3 Jul. 1972 Sponsored by AEC
(NAonr-13-72)
(LA-DC-72-705; Conf-720711-1) Avail: NTIS

The application of the turbulence transport equations to problems in which the driving force is buoyancy rather than mean flow shear is reported. In the mean gross flow calculation, the gross motion of the fluids is represented by two dimensional solutions of the Navier-Stokes equation in a fixed reference frame. Turbulence transitions are discussed. F.O.S.

N73-15315# Los Alamos Scientific Lab., N.Mex.
TRANSIENT THREE DIMENSIONAL FLUID FLOW IN THE VICINITY OF LARGE STRUCTURES
B. D. Nichols and C. W. Hirt 1972 8 p refs Presented at 3d Intern. Conf. on Numerical Methods in Fluid Dynamics, Paris, France, 3 Jul. 1972 Sponsored by AEC
(LA-DC-72-711; Conf-720711-2) Avail: NTIS

A numerical technique has been developed for calculating the three dimensional, transient dynamics of an incompressible fluid with an optional free surface. It uses an Eulerian finite difference approximation to the Navier-Stokes equations for incompressible flows. Additional features include heat transport and thermal buoyancy in a Boussinesq approximation, and a particulate transport scheme is included that uses an equation of motion for each particle. Particle motions are allowed to be influenced through the effects of gravity, fluid drag, and diffusion. The basic numerical technique and each of the additional features, as well as a data display technique developed especially for the presentation of three dimensional results are described. Author

N73-15316# Los Alamos Scientific Lab., N.Mex.
ANALYSIS OF THE RAYLEIGH-TAYLOR PROBLEM OF SUPERPOSED FLUIDS. THE INVISCID INCOMPRESSIBLE-IRROTATIONAL CASE; STEADY-STATE SOLUTIONS
George H. Pimbley, Jr. Aug. 1972 35 p refs
(Contract W-7405-eng-36)
(LA-4839) Avail: NTIS

The problem of the shape of the accelerated interface between a light and a heavy fluid is introduced using the velocity potential. It is then shown that the problem admits steady state solutions that form continuous branches bifurcating from a trivial solution, quite a usual picture with nonlinear problems. With a fixed periodicity, these branches of solutions are unstable if rectilinear coordinates are used. However, if one of the variables is allowed to be arc length along the interface, with a fixed period in the arc length, there exists a branch of stable steady state solutions. The corresponding interface shapes are studied. When stable they represent possible initial persisting configurations. Author

N73-15317# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.
EXPERIMENTAL STUDY OF MIXED CONVECTION IN A PIPE
M. Wendling, R. Martin, and R. Ricque [1971] 8 p refs In FRENCH; ENGLISH summary Presented at 14th Congr. of the Intern. Assoc. for Hydraulic Res., Paris, 27 Aug. 1971
(CEA-Conf-2001; Conf-710843-2) Avail: AEC Depository Libraries

Some experimental results obtained on mixed convection in a channel, utilizing sodium as the working fluid are presented. The qualitative aspect of the phenomena and the effect of the main parameters (mean velocity and width of the channel) are considered. Experimental results on turbulent flows are compared with theoretical results on laminar flows. The studies are related to sodium-cooled fast reactors. NSA

N73-15318# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.
TWO-PHASE FLOW TRANSIENTS AND THE STABILITY OF ONCE-THROUGH STEAM GENERATORS
J. Boure [1971] 9 p refs In FRENCH; ENGLISH summary Presented at Intern. Conf. on Heat Exchangers, Paris, 16-18 Jun. 1971
(CEA-Conf-2009; Conf-710051-1) Avail: AEC Depository Libraries

Study of the behavior of once-through steam generators and in particular their stability requires calculation under transient conditions of once-through two-phase flows. Starting from the general conservation principles, an ideal description of the development and use of a practical mathematical model is made. It is thus possible to introduce rationally the constitutive laws which are necessary for the two-phase flow description, and the concepts of superabundant constitutive law and of coherence of the mathematical model. The conservation principles impose compatibility constraints on the various elementary models (i.e., on the constitutive equations) which have to be put in the computer program. With the assumption of one-dimensional flow, six partial different equations appear to be necessary for the transient description of two-phase flows. Author (NSA)

N73-15319# European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.
MEASUREMENT OF CORRELATION PROPERTIES OF THE BUBBLE FIELD IN TWO-PHASE FLOW
W. Matthes May 1972 24 p refs
(EUR-4840) Avail: AEC Depository Libraries

The bubble field in a two-phase flow shows inherent statistical properties which can be described by properly defined correlation functions. These correlation functions represent the whole physics of the two-phase flow in the sense that the space-time flow pattern and the physical interactions between the bubbles, which may be partly induced by the carrier fluid, show up in the detailed structure of this function. General expressions are developed relating experimental results to the correlation function and to the individual items mentioned above. Author (NSA)

N73-15320# United Kingdom Atomic Energy Authority, Harwell (England).
AIR-WATER, ANNULAR FLOW IN A HORIZONTAL TUBE
D. Butterworth Feb. 1971 57 p refs Presented at Intern. Symp. on Two-Phase Systems, Haifa, Israel, 29 Aug. 1971
(AERE-R-6687; Conf-710836-2) Avail: AEC Depository Libraries

Experiments were conducted on low-pressure, air-water, annular flow in a 31.8 mm ID horizontal tube. For two flow conditions and for two distances downstream of liquid injection, the film characteristics were measured as a function of circumferential position, and liquid entrainment measurements were made in the gas core. Large variations in these measurements with circumferential position were found but the variation with length was small. The total entrainment flowrates were estimated from the sampling studies, and, by using the Hewitt model, the film flowrates were estimated from the film thickness measurements. In evaluating the Hewitt model, it was assumed that the wall shear was constant around the perimeter of the tube. The sum of the calculated film flowrate and entrainment flowrates was found to be in good agreement with the input liquid flow. Author (NSA)

N73-15321# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
VELOCITY AND ENERGY OF AN ABRASIVE PARTICLE IN CAVITATION LIQUID
B. A. Agranat, V. I. Bashkirov, V. A. Dokuchaeva, and A. P. Chernov 11 Aug. 1972 19 p refs Transl. into ENGLISH from Ultrazvukovye Metody Intensifikats i Tekhnol. Protsessov (USSR), no. 60, 1970 p 43-53
(AF Proj. 7343)
(AD-750500; FTD-MT-24-292-72) Avail: NTIS CSCL 20/4

The kinetic energy of abrasive particles of various sizes was determined at which particles are knocked out from a metal surface during an impact. The shock wave arises during secondary extension of a cavitation cavity. The absolute velocity in the compression of the cavity can be determined by solving the equations for the motion of a vapor gas bubble in a sonic field on a computer. It is assumed that the vapor behaves in a compression like an ideal gas. Author (GRA)

N73-15322# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Mechanics.
NUMERICAL INVESTIGATION OF UNSTEADY BOUNDARY LAYER SEPARATION

D. P. Telionis, D. TH. Tsahalis, and M. J. Werle (Cincinnati Univ.) Sep. 1972 35 p refs
(Contract N00014-70-C-0024; Grant NSF GK-32622; NR Proj. 061-180)
(AD-750398; VPI-E-72-14) Avail: NTIS CSCL 20/4

It has been previously indicated both theoretically and experimentally that for steady flow over moving boundaries, the vanishing of skin friction does not mean separation and that separation occurs at a station where the generalized Moore-Rott-Sears (MRS) criterion is satisfied. The authors have earlier indicated numerically that the Goldstein-type separation-singularity appears at the point where the MRS criterion is satisfied. In the present paper and in accordance with the theoretical work of Sears and one of the authors, this idea is extended to unsteady flows. A Goldstein-type of a traveling singularity is discovered and interpreted as unsteady boundary-layer separation. The features of the flow in the neighborhood of this singularity are investigated. Author (GRA)

N73-15323# Ballistic Research Labs., Aberdeen Proving Ground, Md.
MCCOWAN'S SOLITARY WAVE EXPANSIONS
Serge J. Zaroodny Aug. 1972 22 p refs
(DA Proj. 1T0-61101-A-91A)
(AD-750565; BRL-MR-2219) Avail: NTIS CSCL 20/4

In 1894 McCowan proposed that the structure of solitary waves be represented by a certain series expansion; but he gave an estimate for only the first term of this expansion. Any truncation of such an expansion compromises the essential ideal of the steadiness of a solitary wave; also, the approximations which he adopted might not be the best ones for the diverse particular purposes for which this wave may be used. In the paper a more precise structure of this wave is constructed by implementing McCowan's expansion to higher orders. The coefficients in this expansion are determined by minimizing a certain reasonable measure of the imperfection of this expansion. This minimization is done by using the FNMIN subroutine.
Author (GRA)

N73-15324# Grumman Aerospace Corp., Bethpage, N.Y.
INTERFERENCE HEATING DUE TO SHOCK IMPINGEMENT Final Report, May 1971 - Jul. 1972
Robert A. Haslett, Louis G. Haufman, II., Richard F. Romanowski, and Michael Urkowitz Jul. 1972 178 p refs
(Contract F33615-71-C-1383; AF Proj. 1366)
(AD-749946; AFFDL-TR-72-66) Avail: NTIS CSCL 20/4

Investigation of the interference heating phenomenon was conducted at Mach number 8 over a Reynolds number range from 400 thousand to 3.7 million per ft in the hypersonic wind tunnel. Shock generator models consisted of 1.5, 5, 10 and 15 deg wedges; 2.5, 7.5 and 12.5 deg cones; .5 and 2.0 in. diameter hemispheres, and an orbiter-type vehicle. Shock receiver models included sharp and blunt flat plates and a booster vehicle. Both pressure distributions and heat transfer distributions were obtained in the regions of shock impingement. The test program was organized in a building-block approach. A limited number of sharp plate runs were performed with a boundary layer trip to obtain turbulent data for comparison with other experiments.
Author (GRA)

N73-15325# California Univ., Berkeley. Fluid Mechanics Div.
FORMULATION OF FINITE DIFFERENCE METHOD FOR THE UPPER CRITICAL DEPTH PROBLEM
Maurice Holt Aug. 1972 12 p refs
(Contract N00014-69-A-0200-1020)
(AD-749818; FM-72-3) Avail: NTIS CSCL 19/4

A numerical method is outlined for calculating the interaction between an underwater spherical shock wave and the ocean surface. The method is carried out in two half steps, the first based on a second order implicit scheme and the second based on integral formulae. Author (GRA)

N73-15326# Mississippi State Univ., State College. Dept. of Aerophysics and Aerospace Engineering.
AERODYNAMICS OF ROTORS AND PROPELLERS Final Report
Charles B. Cliett, Joe F. Thompson, Zahir U. A. Warsi, and Donald W. Boatwright 31 Aug. 1972 23 p refs
(Contract DA-ARO(D)-31-124-G156; DA Proj. 200-61102-B-35E)
(AD-750175; AASE-72-78; EIRS-ASE-73-1; AROD-10234-5-E) Avail: NTIS CSCL 20/4

The work described in the report is part of a continuing effort in Research in the Area of Aerodynamics of Rotors and Propeller and will be continued under parallel contract DAH-C04-68-C-0003. The research involved is of a long term nature. Technical reports and journal articles have been published which cover a portion of the described research. Additional papers have been submitted for review and others are in preparation. The report seeks to give the more important results and conclusions as well as the progress made toward the overall objectives of the research effort. Author (GRA)

N73-15327# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THREE-DIMENSIONAL SUPERSONIC DETACHED CURRENTS IN FLOWING PAST SOLID AND GASEOUS BARRIERS WITH A SUPERSONIC STREAM
A. N. Zubkov 17 Aug. 1972 12 p refs Transl. into ENGLISH from Teplo-1 Massoperenos (USSR), 1969 p 69-72
(AD-750522; FTD-HT-23-349-72) Avail: NTIS CSCL 20/4

Results are presented of the investigation of supersonic flow past solid cylindrical and jet (circular jet) barriers on a plate. It is shown that absence before the jet of a region of very low pressure leads, at identical dimensions of the met and equivalent solid, to absence before the jet of local supersonic zones.
Author (GRA)

N73-15328# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE THEORY OF THE CRITICAL CONDITIONS OF A GAS EJECTOR AT LARGE PRESSURE DROPS
V. N. Gusev 28 Jul. 1972 16 p refs Transl. into ENGLISH from Tsentr. Aerogidrodinamicheskii Inst. Uch. Zap. (USSR), v. 1, no. 3, 1970 p 91-96
(AD-750536; FTD-MT-24-5-72) Avail: NTIS CSCL 20/4

The critical operating conditions of an ejector with a cylindrical mixing chamber are analyzed within the framework of ideal-gas dynamics. Jet flows, overexpanded with respect to the static pressure of a low-pressure gas, are calculated on the basis of supersonic compressed layer theory. The calculations confirm the experimental finding that the degrees of compression attainable in ejectors in the presence of large pressure gradients exceed the limiting analytical values obtained from theories developed for moderate pressure gradients. Author (GRA)

N73-15329# Military Academy, West Point, N.Y. Dept. of Mechanics.
THE FREQUENCY RESPONSE OF A PNEUMATIC TEE JUNCTION
Frank J. Redd and Frank Cardile 1972 14 p refs
(AD-750369) Avail: NTIS CSCL 13/7

The paper compares data obtained from an experimental analysis of the frequency response of a pneumatic tee junction to analytical curves resulting from an ideal, acoustic, one dimensional analysis. GRA

N73-15330# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
THREE EXPERIMENTS IN NATURAL CONVECTION
Robert D. Haberstroh, Richard I. Loehrke, Richard D. Reinders, Ovid A. Plumb, and James M. Broughton Sep. 1972 64 p refs
(Contract N00014-67-A-0299-0009; NR Proj. 083-250)
(AD-750762; TR-2) Avail: NTIS CSCL 20/4

The report presents detailed summaries of three experimental theses written at Colorado State University in connection with ongoing work on natural convection in doubly-diffusive media. Chapter 1 deals with the turbulent natural-convection heat flux through two liquid layers which are artificially and permanently stratified by density difference. A predictive model is advanced and tested against experimental data. The second chapter discusses experiments on the heat transfer from circular disks at the bottoms of the large tanks. Both the laminar and turbulent flow regimes are considered, and heat-transfer correlations are obtained. An uncorrelated effect of source diameter is noted

and discussed. The third chapter treats mainly on the transport of heat and salt across turbulently convecting layers of salt water bounded above and below by thick, stable thermoclines. Both temperature and concentration are made to decrease upward in a steady or nearly steady experiment, and measurements are made of the flows of heat and salt. Observations are made of the properties of the thermoclines and of the convecting layers, and comparisons are made with the limited number of theoretical predictions currently available. Author (GRA)

N73-15331# ARO, Inc., Arnold Air Force Station, Tenn.
ANALYSIS OF LAMINAR BOUNDARY LAYERS ON RIGHT CIRCULAR CONES AT ANGLE OF ATTACK, INCLUDING STREAMLINE SWALLOWING EFFECTS Final Report, Sep. 1970 - Apr. 1972
Arloe Wesley Mayne, Jr. AEDC Oct. 1972 107 p refs (Contract F40600-73-C-0004)
(AD-750130; AEDC-TR-72-134; ARO-VKF-TR-72-117) Avail: NTIS CSCL 20/4

A method has been developed for treating the three-dimensional compressible laminar boundary-layer equations for a right circular cone at angle of attack in supersonic and hypersonic flow. Swallowing by the boundary layer of the inviscid entropy layer (streamline swallowing) has been treated by means of a mass-flow balance between the inviscid and viscous flowfields. The boundary-layer equations were developed in a general Crocco-variables form. A finite-difference technique was formulated for solving the governing equations and treating the streamline-swallowing phenomenon. The resulting second-order difference equations are solved in an iteration scheme. Author (GRA)

N73-15332# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDY OF LIQUID VISCOSITY BY MEANS OF VIBRATION METHOD
V. N. Genrikh, A. B. Kaplum, and A. N. Solovev 18 Aug. 1972 42 p refs Transl. into ENGLISH from the publ. "Issledovaniya Teplopizicheskikh Svoistv Veshchestv" USSR, 1967 p 112-136
(AD-750915; FTD-HT-23-332-72) Avail: NTIS CSCL 14/2

The viscosity of Gallium during supercooling was measured. Gallium was melted, after which the temperature was quickly lowered to a given value. It is then held constant for 2-3 hrs as the viscosity was measured. Gallium was subsequently heated to 95-8 degrees and again the viscosity was determined. Quick raising and lowering of temperature guarantees preservation of solid phase residues at temperatures greater than the melting point and does not allow the emergence of the solid phase during cooling. Author (GRA)

N73-15333# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STATIONARY FLOW OF EQUAL-DENSITY SUSPENSIONS THROUGH TUBES
V. M. Borisov, G. V. Markov, and S. Palicova 17 Aug. 1972 16 p refs Transl. into ENGLISH from Zh. Vychislitelnoi Mat. i Mat. Fiz. (Moscow), no. 3, 1971 p 738-745
(AD-750924; FTD-HC-23-1189-72) Avail: NTIS CSCL 20/4

The steady-state one-dimensional motion of uniformly dense suspensions is considered. The suspension is considered as a continuous medium, the state of which at each point under steady-state motion is characterized by three variables: the concentration of particles, the velocity, and the effective viscosity. The effective viscosity is defined as the proportionality coefficient between the amount of energy E dispersed in a unit volume per unit time and the second invariant deformation velocity vector of the medium. The analysis is based on a maximum principle of the dispersed energy in steady-state motion. Author (GRA)

N73-15334# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CALCULATION OF THE DISTRIBUTION OF LOSSES OVER THE SPAN OF AN AXIAL-FLOW COMPRESSOR BLADE
V. S. Beknev and V. Yu. Kozhevnikov 2 Aug. 1972 14 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Mashinostr. (USSR), no. 2, 1971 p 109-113
(AF Proj. 668A)
(AD-750931; FTD-MT-24-245-72) Avail: NTIS CSCL 13/7

On the basis of experimental data, relationships are obtained which make it possible to calculate the losses at each cross section with respect to the height of an axial compressor blade. The obtained results permit a judgment to be made concerning the influence of various cascade parameters upon the distribution of losses with respect to blade height. Author (GRA)

N73-15335# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE INFLUENCE OF REAL PROPERTIES OF AIR ON FLOW PARAMETERS AROUND AN ELLIPTICAL CONE. THE AERODYNAMIC CHARACTERISTICS OF ELLIPTICAL CONES AT LARGE ANGLES OF ATTACK
A. P. Bazzhin, O. N. Trusova, and I. F. Chelysheva 28 Jul. 1972 16 p refs Transl. into ENGLISH from Tsentr. AerogiDrodinamicheskii Inst. Uch. Zap. (USSR), v. 1, no. 2, 1970 p 46-52
(AD-749738; FTD-MT-24-6-72) Avail: NTIS CSCL 20/4

Calculations are presented of the hypersonic flow around an elliptical cone oriented at a 30 deg angle of attack in air flows with speeds of 2350, 3356, and 6713 m/sec. The air was treated as a three-component (nitrogen, oxygen, and nitrogen) gas, and its thermodynamic functions were calculated by a standard program. The results are graphically compared with those for a perfect gas. The second part of the study shows the calculated behavior of lift, drag, and pitch-moment coefficients in a perfect gas as functions of three vertex angles and angles of attack from 30 to 50 deg at Mach 7. Author (GRA)

N73-15000 Technische Hogeschool, Delft (Netherlands). Dept. of Aeronautical Engineering.
SOME RESEARCH ON TWO DIMENSIONAL LAMINAR SEPARATION BUBBLES
E. Dobbinga, J. L. VanIngen, and J. W. Kooi *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 8 p refs (For availability see N73-14998 06-02)

N73-15001 Centre National de la Recherche Scientifique, Meudon (France).
THEORETICAL AND EXPERIMENTAL RESEARCH OF TAKE OFF DRAG DEFORMATION OF LOCAL SURFACE [RECHERCHES THEORIQUES ET EXPERIMENTALES SUR LES DECOLLEMENTS LIES A UNE DEFORMATION LOCALE DE SURFACE]
S. Burnel, G. B. Diep, P. Gougat, and B. Prunet-Foch *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 11 p refs In FRENCH (For availability see N73-14998 06-02)

N73-15002 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
AIRFOIL STALL PREDICTION IN INCOMPRESSIBLE FLOW
Michel Vincent DePaul *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 15 p refs In FRENCH; ENGLISH summary (For availability see N73-14998 06-02)

N73-15003 Northrop Corp., Hawthorne, Calif. Aircraft Div.
PARAMETRIC STUDIES OF SEPARATING TURBULENT BOUNDARY LAYER FLOWS
Andrzej Wortman and W. J. Franks *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 9 p refs (For availability see N73-14998 06-02)

N73-15006 Avions Marcel Dassault, Saint-Cloud (France).
BLOCKAGE CORRECTIONS IN BLOWING TESTS OF EFFECTS OF TAKE-OFF [CORRECTION DE BLOCAGE DANS LES ESSAIS EN SOUFFLERIE EFFETS DES DECOLLEMENTS]
Jean-Ch. Vayssaire *In* AGARD Fluid Dyn. of Aircraft Stalling Nov. 1972 22 p refs In FRENCH; ENGLISH summary (For availability see N73-14998 06-02)

N73-15912 Tohoku Univ., Sendai (Japan).
PERFORMANCE ANALYSIS ON A SUPERCAVITATING JET FLAPPED HYDROFOIL
R. Oba and J. Higuchi *In its* Repts. of the Inst. of High Speed Mech., Tohoku Univ., Vol. 26 1972 p 15-40 refs Presented at the 49th Conf. of Jap. Soc. Mech. Engr., 3 Apr. 1972 (For availability see N73-15910 06-32)
(Rept-249)

N73-15913 Tohoku Univ., Sendai (Japan).
BREAKDOWN OF SWIRLING CAVITY FLOW IN A CIRCULAR PIPE. REPORT 2: INVESTIGATIONS OF CAVITY SURFACE
H. Hashimoto *In its* Repts. of the Inst. of High Speed Mech., Tohoku Univ., Vol. 26 1972 p 41-72 refs Presented at the 46th Gen. Meeting of the Japan Soc. of Mech. Engr., 3 Apr. 1969 (For availability see N73-15910 06-32)
(Rept-250)

N73-15914 Tohoku Univ., Sendai (Japan).
SURFACE PRESSURE DISTRIBUTION ON HYDROFOIL PROFILES IN CASCADE. REPORT 2: ACCELERATING CASCADE FLOW
F. Numachi *In its* Repts. of the Inst. of High Speed Mech., Tohoku Univ., Vol. 26 1972 p 73-108 refs Presented at the 47th Gen. Meeting of the Japan Soc. of Mech. Engr., 31 Mar. 1970 (For availability see N73-15910 06-32)
(Rept-251)

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N73-15336 National Lending Library for Science and Technology, Boston Spa (England).
THE SECULAR VARIATION OF THE POLE TIDE ON THE EARTH
I. V. Maksimov 13 May 1971 17 p refs Transl. into ENGLISH from Tr. Arkt. Antarkt. Nauchn.-Issled. Inst. (Leningrad), v. 293, 1970 p 88-101
(NLL-M-20647-(5828.4F)) Avail: Natl. Leading Library, Boston Spa, Engl.: 2 NLL photocopy coupons

Data observed from 1895 through 1950 are examined to determine the dimensions of the pole tide in the sea and atmosphere. The mean values of the phase and amplitude of the 14-month fluctuations are calculated for overlapping 7-year periods. Long-term variations in amplitudes of pressure waves in Edinburgh, indices of seasonal activity of the Iceland low compared with the dimensions of free oscillations of the earth's axis of rotation, and secular variations in the pole tide dimensions in sea and atmosphere are determined and illustrated. The investigation indicates that the pole tide pressure wave can change the mean monthly pressure value by 4.0 to 8.0 mm Hg during a year. N.E.N

N73-15337*# Earth Satellite Corp., Washington, D.C.
FACILITATING THE EXPLOITATION OF ERTS IMAGERY USING SNOW ENHANCEMENT TECHNIQUES Bimonthly Progress Report
Frank J. Wobber, Principal Investigator, Kenneth Martin, Charles Sheffield, Orville Russell, and Roger Amato 3 Jan. 1973 28 p
(Contract NAS5-21744)
(E73-10001; NASA-CR-129925) Avail: NTIS HC $3.50 CSCL 08L

The author has identified the following significant results. EarthSat has established an effective mail-based method for obtaining timely ground truth (snow depth) information over an extensive area. The method is both efficient and inexpensive compared with the cost of a similarly scaled direct field checking effort. Additional geological information has been acquired which is not shown in geological maps in the area. Excellent quality snow-free ERTS-1 transparencies of the test areas have been received and are being analyzed.

N73-15338*# International Imaging Systems, Mountain View, Calif.
PROPOSAL FOR OCEAN WATER COLOR ASSESSMENT FROM ERTS-A RBV AND MSS IMAGERY Progress Report, Nov. - Dec. 1972
Donald S. Ross, Principal Investigator Dec. 1972 1 p
(Contract NAS5-21862)
(E73-10002; NASA-CR-129926) Avail: NTIS HC $3.00 CSCL 08J

There are no author-identified significant results in this report.

N73-15339*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
ECOLOGICAL EFFECTS OF STRIP MINING IN OHIO Bimonthly Progress Report, 1 Nov. 1972 - 1 Jan. 1973
Phillip Chase, Principal Investigator 1 Jan. 1973 5 p
(Contract NAS5-21762)
(E73-10003; NASA-CR-129927; Rept-73-141-079) Avail: NTIS HC $3.00 CSCL 08I

The author has identified the following significant results. One result significant as a practical application and for cost benefit analysis is the relative ease with which ERTS-1 will monitor new and unclaimed stripping activities in Southeastern Ohio and in all of Appalachia. Band 5 resolution appears to be better than the often reported 80 meters. The strip mines stand out well enough to be easily identified without other graphic aids. Standing water within the strip mined area stands out in either bands 6 or 7. Areas of several acres are visible. Significant increases in surface extent of water of stripped areas should be detectable on a comparative basis. The degree of reclamation is observable in the imagery in rather gross percentage steps and for areas larger than the bare earth sizes in the table. The gradation in tones in the different bands indicates that probability density imagery using the four bands in CCT data (and statistical processing) is likely to separate degrees of vegetative reclamation.

N73-15340*# Texas Instruments, Inc., Dallas.
EVALUATION OF COMMERCIAL UTILITY OF ERTS-A IMAGERY IN STRUCTURAL RECONNAISSANCE FOR MINERALS AND PETROLEUM Progress Report, 1 Nov. - 31 Dec. 1972
Donald F. Saunders, Principal Investigator 8 Jan. 1973 4 p
(Contract NAS5-21796)
(E73-10004; NASA-CR-129928) Avail: NTIS HC $3.00 CSCL 08G

The author has identified the following significant results. Initial analytical results in Area 3 have been very encouraging. Not only have new major lineaments been detected but many of the intersections of those lineaments correlate with the general location of known mineral deposits while others appear to outline petroleum-bearing basins and uplifts. If later analyses confirm these results the economic impact of ERTS type imagery could be very significant in worldwide mineral and petroleum reconnaissance.

N73-15341*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
ERTS-1 IMAGERY OF EASTERN AFRICA: A FIRST LOOK AT THE GEOLOGICAL STRUCTURE OF SELECTED AREAS
Paul A. Mohr, Principal Investigator 20 Dec. 1972 65 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(Contract NAS5-21748)
(E73-10005; NASA-CR-129929; SAO-347; Rept-211-056) Avail: NTIS HC $5.25 CSCL 08G

The author has identified the following significant results. Imagery of the African rift system resolves the major Cainozoic faults, zones of warping, and associated volcanism. It also clearly depicts the crystal grain of the Precambrian rocks where these are exposed. New structural features, or new properties of known features such as greater extent, continuity, and linearity are revealed by ERTS-1 imagery. This applies, for example, to the NE-SW fracture zones in Yemen, the Aswa mylonite zone at the northern end of the Western Rift, the Nandi fault of western Kenya, the linear faults of the Elgeyo escarpment in the Gregory Rift, and the hemibasins of warped Tertiary lavas on the Red Sea margin of Yemen, matching those of Ethiopian plateau-Afar margin. A tentative scheme is proposed, relating the effect on the pattern of Cainozoic faulting of the degree of obliquity to Precambrian structural trend. It is particularly noteworthy that, even where the Precambrian grain determines the rift faulting to be markedly oblique to the overall trend of the rift trough, for example, in central Lake Tanganyika, the width of the trough

is not significantly increased. Some ground mapped lithological boundaries are obscure on ERTS-1 imagery.

N73-15342*# Itek Corp., Lexington, Mass. Optical Systems Div.
AUTOMATED THEMATIC MAPPING AND CHANGE DETECTION OF ERTS-1 IMAGES
Nicholas Gramenopoulos, Principal Investigator and H. Alpaugh Dec. 1972 22 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(Contract NAS5-21766)
(E73-10006; NASA-CR-129930) Avail: NTIS HC $3.25 CSCL 08B

The author has identified the following significant results. An ERTS-1 image was compared to aircraft photography and maps of an area near Brownsville, Texas. In the coastal region of Cameron County, natural and cultural detail were identified in the ERTS-1 image. In Hidalgo County, ground truth was located on the ERTS-1 image. Haze and 50% cloud cover over Hidalgo County reduced the usefulness of multispectral techniques for recognizing crops.

N73-15343*# Delaware Univ., Newark. Coll. of Marine Studies.
APPLICATION OF ECOLOGICAL, GEOLOGICAL AND OCEANOGRAPHIC ERTS-1 IMAGERY TO DELAWARE'S COASTAL RESOURCES PLANNING
V. Klemas, Principal Investigator and D. Bartlett 11 Jan. 1973 4 p
(Contract NAS5-21837)
(E73-10007; NASA-CR-129931) Avail: NTIS HC $3.00 CSCL 08J

There are no author-identified significant results in this report.

N73-15344*# Oregon State Univ., Corvallis.
COMPARATIVE EVALUATION OF ERTS-A IMAGERY FOR RESOURCE INVENTORY IN LAND USE PLANNING Progress Report, period ending 31 Dec. 1972
Gerald H. Simonson, Principal Investigator 10 Jan. 1973 22 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(Contract NAS5-21831)
(E73-10008; NASA-CR-129932) Avail: NTIS HC $3.25 CSCL 08F

There are no author-identified significant results in this report. Evaluation has begun on ERTS-1 imagery of Crook County for use in landform interpretation and geologic mapping and interpretation. Outside of Crook County the geology team has been impressed by the display of fault patterns in southeastern Oregon and has begun preliminary analyses of these. Using the color combiner a complete timber type map of (1) all the forest land within Crook County, and (2) all the Ochoco National Forest has been completed. The timber types consist of five density classes which are correlated with different species compositions as the first step in the multistage forest inventory. Using the ERTS magnetic tape data the computer center has produced a 12 by 25 mile strip printout of bands 5, 6, and 7. The computer printouts are to be analyzed for different timber types and possible insect damage. Other results are: (1) limited number of clearcuts in eastern Oregon and in Cascades evident; (2) positive transparencies of band 5 appear to be too dark for maximum information of forested areas; and (3) much more information in the computer printouts of bands 6 and 7, than 5, when analyzing forest conditions. A.L.

N73-15345*# Massachusetts Univ., Amherst.
MAPPING OF DUNE FIELDS IN INACCESSIBLE REGIONS Progress Report
H. T. U. Smith, Principal Investigator Dec. 1972 1 p
(Contract NAS5-21871)
(E73-10009; NASA-CR-129933) Avail: NTIS HC $3.00 CSCL 08B

There are no author-identified significant results in this report.

N73-15346*# Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
AN INTERDISCIPLINARY STUDY OF THE ESTUARINE AND COASTAL OCEANOGRAPHY OF BLOCK ISLAND SOUND AND ADJACENT NEW YORK COASTAL WATERS Interim Report, Jul. - Dec. 1972
Edward F. Yost, Principal Investigator Dec. 1972 51 p Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(Contract NAS5-21792)
(E73-10010; NASA-CR-129936; TR-20-I) Avail: NTIS HC $4.75 CSCL 08C

The author has identified the following significant results. The synoptic repetitive coverage of the multispectral imagery from the ERTS-1 satellite, when photographically reprocessed using the state-of-the-art techniques, has given indication of spectral differences in Block Island and adjacent New England waters which were heretofore unknown. Of particular interest was the possible detection of relatively small amounts of phytoplankton prior to the occurrence of the red tide in Massachusetts waters. Preparation of spatial and temporal hydrographic charts using ERTS-1 imagery and ground truth analysis will hopefully determine the environmental impact on New York coastal waters.

N73-15347*# TRW Systems Group, Redondo Beach, Calif.
PRELIMINARY RESULTS OF THE COMPUTER SIMULATION OF DATA COMPRESSION USING ERTS-A MSS DIGITAL TAPES
Donald J. Spencer, Principal Investigator and Curtis L. May 3 Jan. 1973 43 p
(Contract NAS5-21746)
(E73-10011; NASA-CR-129937) Avail: NTIS HC $4.25 CSCL 05B

There are no author-identified significant results in this report.

N73-15348*# TRW Systems Group, Redondo Beach, Calif.
ERTS IMAGE DATA COMPRESSION TECHNIQUE EVALUATION Monthly Progress Report, period ending 29 Dec. 1972
Donald J. Spencer, Principal Investigator 3 Jan. 1973 1 p
(Contract NAS5-21746)
(E73-10012; NASA-CR-129938) Avail: NTIS HC $3.00 CSCL 05B

There are no author-identified significant results in this report.

N73-15349*# Maine Dept. of Transportation, Augusta.
TO MAP THE DISTRIBUTION OF GLACIOFLUVIAL DEPOSITS AND ASSOCIATED GLACIAL LANDFORMS Progress Report
Raymond G. Woodman, Principal Investigator 1 Jan. 1973 3 p
(Contract NAS5-21747)
(E73-10013; NASA-CR-129939; PR-4) Avail: NTIS HC $3.00 CSCL 08B

There are no author-identified significant results in this report.

N73-15350*# Maine Dept. of Transportation, Augusta. Materials and Research Div.
TO DEVELOP A LAND USE PEAK RUNOFF CLASSIFICATION SYSTEM FOR HIGHWAY ENGINEERING PURPOSES Interim Report, Jun. - Dec. 1972
Ernest G. Stoeckeler, Principal Investigator 30 Dec. 1972 6 p
(Contract NAS5-21724)
(E73-10014; NASA-CR-129940) Avail: NTIS HC $3.00 CSCL 08M

The author has identified the following significant results. Bands 6 and 7 are excellent for the detection of surficial water and swampy sites having the water table at or near the ground surface. Water bodies less than five acres in extent have been identified. Color composites should provide considerably more data for visual analysis than the black and white products currently available to this investigation.

N73-15351*# New Mexico State Bureau of Mines and Mineral Resources, Socorro.
GEOLOGIC ANALYSIS AND EVALUATION OF ERTS-A IMAGERY FOR THE STATE OF NEW MEXICO Progress Report, 14 Nov. 1972 - 14 Jan. 1973
Frank E. Kottlowski, Principal Investigator 14 Jan. 1973 4 p
(Contract NAS5-21861)
(E73-10015; NASA-CR-129941) Avail: NTIS HC $3.00

CSCL 08G

There are no author-identified significant results in this report.

N73-15352*# National Environmental Satellite Service, Washington, D.C.

EVALUATION OF ERTS DATA FOR CERTAIN HYDROLOGICAL USES Progress Report, Oct. - Nov. 1972

Donald R. Wiesnet and David F. McGinnis, Principal Investigators Nov. 1972 4 p

(NASA Order S-70246-AG)

(E73-10016; NASA-CR-129942) Avail: NTIS HC $3.00 CSCL 08H

There are no author-identified significant results in this report.

N73-15353*# National Environmental Satellite Service, Washington, D.C.

EVALUATION OF ERTS DATA FOR CERTAIN OCEANOGRAPHIC USES Progress Report, Oct. - Dec. 1972

Alan E. Strong, Principal Investigator Dec. 1972 3 p

(NASA Order S-70246-AG)

(E73-10017; NASA-CR-129943) Avail: NTIS HC $3.00 CSCL 08C

The author has identified the following significant results. A thick algal mat in the Bass Islands area several hundred feet wide and 10-15 miles long can be seen along the western edge of the ERTS-1 imagery.

N73-15354*# Earth Satellite Corp., Berkeley, Calif.

MINERAL EXPLORATION POTENTIAL OF ERTS-1 DATA Progress Report

William A. Brewer, Principal Investigator 9 Jan. 1973 3 p

(Contract NAS5-21745)

(E73-10018; NASA-CR-129944) Avail: NTIS HC $3.00 CSCL 08G

There are no author-identified significant results in this report.

N73-15355*# Nevada Univ., Reno. Div. of Renewable Natural Resources.

USE OF SATELLITE IMAGERY FOR WILDLAND RESOURCE EVALUATION Progress Report, Dec. 1972 - Jan. 1973

Paul T. Tueller, Principal Investigator 15 Jan. 1973 9 p

(Contract NAS5-21870)

(E73-10019; NASA-CR-129945) Avail: NTIS HC $3.00 CSCL 08F

The author has identified the following significant results. Crested wheatgrass seedings have been quantified for the state of Nevada, and have been broken down by county and land status. The wide coverage of ERTS-1 has been found to be extremely useful for putting these seeded areas in the proper perspective for inventory. In the same manner, water bodies are being inventoried and changes relating to time are being monitored. Water resources are critical in Nevada, and this should prove useful to land owners and land managers throughout the state.

N73-15356*# Kennecott Exploration, Inc., Salt Lake City, Utah. Exploration Services Dept.

RECOGNITION OF THE GEOLOGIC FRAMEWORK OF PORPHYRY DEPOSITS ON ERTS-1 IMAGERY Progress Report, Nov. - Dec. 1972

John C. Wilson, Principal Investigator and Leslie W. Camp 2 Jan. 1973 5 p

(Contract NAS5-21769)

(E73-10020; NASA-CR-129946) Avail: NTIS HC $3.00 CSCL 08G

The author has identified the following significant results. Preliminary analysis of a mosaic composing 20 individual ERTS-1 frames that covers most of Nevada and western Utah reveals both new and old structural features. Three separate provinces, the Basin and Range, the southern extension of the Columbia River Plateau volcanics, and the western edge of the Colorado Plateau are easily distinguishable. A west-northwest cross or transverse structural trend, the Las Vegas Shear zone, is present in the region running from the Sierra Nevada to Lake Mead. The Sevier, Hurricane and Grand Wash faults that define the Wasateh-Jerome structural zone, can be traced further on the ERTS-1 imagery than on existing tectonic maps. By use of a stereo viewer on the side-lap coverage of ERTS-1 imagery, it is possible in some instances to determine the direction of sedimentary beds, enabling anticlines and synclines to be mapped. Other geologic features, faults, direction of throw on faults, recent basalt flow contacts with older rhyolitic tuffs, volcanic cones, and subsidences can also be mapped.

N73-15357*# Itek Corp., Lexington, Mass. Optical Systems Div.

AUTOMATED THEMATIC MAPPING AND CHANGE DETECTION OF ERTS-A IMAGES Progress Report, 15 Nov. 1972 - 15 Jan. 1973

Nicholas Gramenopoulos, Principal Investigator Jan. 1973 4 p

(Contract NAS5-21766)

(E73-10023; NASA-CR-129953) Avail: NTIS HC $3.00 CSCL 08B

There are no author-identified significant results in this report. This investigation is concerned with the development of automated interpretation techniques for the recognition and indentification of earth resources. The resources will be identified by using both multispectral and spatial signatures. Ground truth data and aircraft underflight photography will be used to train the recognition algorithms. The data processed will be RBV and MSS images acquired by ERTS-1 satellite, over six test sites located in the vicinities of: Phoenix, Arizona; Weslaco, Texas; Cascade Mountains, Washington; New Orleans, Louisiana; Salt Lake City, Utah; and Salton Sea, California. The processed data will be thematic maps of resources consisting of annotated and outlined images. The seasonal changes of hydrologic and agricultural resources will also be identified. The results are expected to be applicable to a future automatic system of resource inventory and management. A.L.

N73-15358*# Cornell Univ., Ithaca, N.Y. New York State Coll. of Agriculture.

APPLICATION OF ERTS IMAGERY TO INVESTIGATING LAND USE AND NATURAL RESOURCES Progress Report, 13 Dec. 1972 - 13 Jan. 1973

Ernest E. Hardy, Principal Investigator 13 Jan. 1973 4 p

(Contract NAS5-21886)

(E73-10024; NASA-CR-129954) Avail: NTIS HC $3.00 CSCL 08F

There are no author-identified significant results in this report.

N73-15359*# Smithsonian Astrophysical Observatory, Cambridge, Mass.

STUDIES OF IMAGES OF SHORT-LIVED EVENTS USING ERTS DATA Progress Report, 1 Nov. - 31 Dec. 1972

William A. Deutschman, Principal Investigator 31 Dec. 1972 3 p

(Contract NAS5-21858)

(E73-10025; NASA-CR-129955) Avail: NTIS HC $3.00 CSCL 05B

The author has identified the following significant results. It has been possible to identify old fires in the Alaskan tundra and to monitor the development of active fires. The area burned can be quickly determined by a number of methods. The ERTS-1 satellite provides a convenient way to monitor fire damage in remote areas.

N73-15360*# Smithsonian Astrophysical Observatory, Cambridge, Mass.

MAPPING OF THE MAJOR STRUCTURES OF THE AFRICAN RIFT SYSTEM USING ERTS-1 Progress Report, Jul. - Dec. 1972

Paul A. Mohr, Principal Investigator Jan. 1973 7 p

(Contract NAS5-21748)

(E73-10026; NASA-CR-129956) Avail: NTIS HC $3.00 CSCL 08F

The author has identified the following significant results. The structural margin of western Afar with the Ethiopian plateau is marked by a rather wide zone of crustal deformation. ERTS-1 imagery has now permitted a more precise mapping of the structures of this marginal zone, and in particular of the discontinuous marginal graben. The tectonic style of the graben is different in the north from the south, and in the latter region the graben is discordant with the regional tectonic trend. The structural margin of the southern Afar with the Somalian plateau is formed, in the western sector, by a remarkable series of

fault-zone splays. Afar-plateau boundary fault-zones successively curve northeast and then NNE to become Afar floor fault-zones, with a distance of about 25 km separating successive turnoffs. The transition from Ethiopian rift to Gulf of Aden tread faulting along this margin is fascinatingly complex. A simplistic crustal thinning model is not adequate to explain all observed structural features of the Afar margins.

N73-15361*# Argus Exploration Co., Newport Beach, Calif.
A RECONNAISSANCE SPACE SENSING INVESTIGATION OF CRUSTAL STRUCTURE FOR A STRIP FROM THE EASTERN SIERRA NEVADA TO THE COLORADO PLATEAU Progress Report, 15 Jun. - 31 Dec. 1972
Ira C. Bechtold, Principal Investigator, M. L. Liggett, and J. F. Childs 19 Jan. 1973 31 p refs
(Contract NAS5-21809)
(E73-10082; NASA-CR-129969) Avail: NTIS HC $3.75 CSCL 08G

There are no author-identified significant results in this report. Research progress in applications of ERTS-1 MSS imagery in study of Basin-Range tectonics is summarized. Field reconnaissance of ERTS-1 image anomalies has resulted in recognition of previously unreported fault zones and regional structural control of volcanic and plutonic activity. NIMBUS, Apollo 9, X-15, U-2, and SLAR imagery are discussed with specific applications, and methods of image enhancement and analysis employed in the research are summarized. Areas studied and methods employed in geologic field work are outlined. A.L.

N73-15362*# Minnesota State Planning Agency, St. Paul.
APPLICATION OF ERTS-1 IMAGERY TO STATE WIDE LAND INFORMATION SYSTEM IN MINNESOTA Progress Report, Jul. - Dec. 1972
Joseph E. Sizer and John R. Borchert, Principal Investigators 15 Jan. 1973 18 p
(Contract NAS5-21801)
(E73-10029; NASA-CR-129984) Avail: NTIS HC $3.00 CSCL 08F

The author has identified the following significant results. To update and refine existing state-wide land resource information systems, the Minnesota State Planning Agency is assessing the feasibility of extracting resource information from ERTS-1 imagery. Work has centered on a comparative analysis of Minnesota Land Management Information System (MLMIS) and ERTS-1 land use classes. The associated problems of determining appropriate data cell size and optimal seasonal timing have also been addressed. Using ERTS-1 images, dominant land use is classified as follows: urban, forest, agriculture, extractive, transportation, water, and wetlands. Preliminary analysis suggests that with appropriate changes in operational definitions these general classes can be further refined for the benefit of MLMIS users. Additional detail appears most feasible extractive classes.

N73-15363*# National Oceanic and Atmospheric Administration, Miami, Fla.
REMOTE SENSING OF OCEAN CURRENTS Bimonthly Report, 4 Nov. 1972 - 4 Jan. 1973
George A. Maul, Principal Investigator 4 Jan. 1973 6 p
(NASA Order S-70246-AG)
(E73-10030; NASA-CR-129970) Avail: NTIS HC $3.00 CSCL 08C

There are no author-identified significant results in this report.

N73-15364*# New York State Museum and Science Service, Albany.
TO EVALUATE ERTS-1 DATA FOR USEFULNESS AS A GEOLOGICAL SENSOR IN THE DIVERSE GEOLOGICAL TERRANES OF NEW YORK STATE Progress Report, period ending 15 Dec. 1972
Yngvar W. Isachsen, Principal Investigator 15 Dec. 1972 14 p
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(Contract NAS5-21764)
(E73-10031; NASA-CR-129971) Avail: NTIS HC $3.00 CSCL 08G

The author has identified the following significant results. In the present imagery, obtained during the full foliage of summer and fall, the greatest amount of spectral geology is displayed in the Adirondack region where bedrock geology is strongly linked to topography. Of the four spectral bands imaged, band 5 and 7 provide the most geological information. The boundary between the basement rocks of the Adirondack Dome and the surrounding Lower Paleozoic rocks is well delineated except in the Northwest Lowlands and along parts of the eastern Adirondacks. Within the basement complex, the most prominently displayed features are numerous north-northeast trending faults and topographic lineaments, and arcuate east-west valleys developed in some of the weaker metasedimentary rocks. The majority of the faults and lineaments shown on the geologic map of New York appear in the ERTS-1 imagery. In addition, many new linears were detected, as well as a number of anomalous curvilinear elements, some circular in plan and measuring up to 25 km in diameter, which do not bear any clear relationship to mapped geological contacts. The possibility that it is an astrobleme will be investigated after snow melts in the spring.

N73-15365*# State of Ohio Dept. of Development, Columbus.
RELEVANCE OF ERTS-1 TO THE STATE OF OHIO Semiannual Progress Report, Jul. - Dec. 1972
David C. Sweet, Principal Investigator, T. L. Wells, and G. E. Wukelic 15 Jan. 1973 41 p Prepared for Battelle Columbus Labs. Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(Contracts NAS5-21782; BCL-72-17/G-1793)
(E73-10032; NASA-CR-129985; SAPR-1) Avail: NTIS HC $4.25 CSCL 08F

The author has identified the following significant results. To date, only one significant result has been reported for the Ohio ERTS program. This result relates to the proven usefulness of ERTS-1 imagery for mapping and inventorying strip-mined areas in southeastern Ohio. ERTS provides a tool for rapidly and economically acquiring an up-to-date inventory of strip-mined lands for state planning purposes which was not previously possible.

N73-15366*# Purdue Univ., Lafayette, Ind.
AN INTERDISCIPLINARY ANALYSIS OF ERTS DATA FOR COLORADO MOUNTAIN ENVIRONMENTS USING ADP TECHNIQUES Semiannual Report, 1 Jul. - 31 Dec. 1972
Roger M. Hoffer, Principal Investigator 31 Dec. 1972 18 p refs
(Contract NAS5-21880)
(E73-10033; NASA-CR-129986) Avail: NTIS HC $3.00 CSCL 08F

There are no author-identified significant results in this report. Research efforts have been placed on: (1) location, acquisition, and preparation of baseline information necessary for the computer analysis, and (2) refinement of techniques for analysis of MSS data obtained from ERTS-1. Analysis of the first frame of data collected by the ERTS-1 multispectral scanner system over the Lake Texoma area has proven very valuable for determining the best procedures to follow in working with and analyzing ERTS data. Progress on the following projects is described: (1) cover type mapping; (2) geomorphology; and hydrologic feature surveys. A.L.

N73-15367*# Geological Survey, Washington, D.C. Geographic Applications Program.
A PRELIMINARY EVALUATION OF LAND USE MAPPING AND CHANGE DETECTION CAPABILITIES USING AN ERTS IMAGE COVERING A PORTION OF THE CARETS REGION Progress Report
Katherine A. Fitzpatrick and Harry F. Lins, Jr. Dec. 1972 13 p ref Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(NASA Order S-70243-AG-3)
(E73-10034; NASA-CR-129987; USGS-DO-73-001; GAP-ETR-3) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. A preliminary study on the capabilities of ERTS data in land use mapping and change detection was carried out in the area around Frederick County, Maryland, which lies in the northwest

corner of the Central Atlantic Regional Ecological Test Site. The investigation has revealed that Level 1 (of the Anderson classification system) land use mapping can be performed and that, in some cases, land undergoing change can be identified. Results to date suggest that more work should be done in areas where land use changes are known to exist, in order to establish some form of base for recognizing the spectral signature indicative of change areas.

N73-15368*# Alabama Univ., Huntsville. Dept. of Engineering Mechanics.
MATHEMATICAL CHARACTERIZATION OF MECHANICAL BEHAVIOR OF POROUS FRICTIONAL GRANULAR MEDIA
Final Technical Report, 1 Jan. - 31 Oct. 1972
T. J. Chung and J. K. Lee Nov. 1972 141 p refs
(Contract NAS8-25102)
(NASA-CR-124006) Avail: NTIS HC $9.25

A new definition of loading and unloading along the yield surface of Roscoe and Burland is introduced. This is achieved by noting that the strain-hardening parameter in the plastic potential function is deduced from the yield locus equation of Roscoe and Burland. The analytical results are compared with the experimental results for plate-bearing and cone-penetrometer problems and close agreements are demonstrated. The wheel-soil interaction is studied under dynamic loading. The rate-dependent plasticity or viscoelastoplastic behavior is considered. This is accomplished by the internal (hidden) variables associated with time-dependent viscous properties directly superimposed with inelastic behavior governed by the yield criteria of Roscoe and Burland. Effects of inertia and energy dissipation are properly accounted for. Example problems are presented. Author

N73-15369*# National Oceanic and Atmospheric Administration, Miami, Fla.
SEA SURFACE TOPOGRAPHY FROM SPACE, VOLUME 1
John R. Apel, ed. Boulder, Colo. Feb. 1972 384 p refs
Proc. of Conf. held at Key Biscayne, Florida, 6-8 Oct. 1971; sponsored by NOAA, NASA, and US Navy
(NASA-CR-130293; NOAA-TR-ERL-228-AOML-7-Vol-1) Avail: NTIS MF $0.95; SOD HC $1.25 CSCL 08C

Conference proceedings covering the problems associated with measuring sea undulations from spacecraft or aircraft, using laser or radar instrumentation, are presented. Detailed summaries are given of system designs, tracking and orbit analysis, geodesy and ground truth, oceanography and meteorology, and radar systems and subsystems. Altimeters for use on both Skylab and GEOS-C satellites are also examined. For individual titles, see N73-15370 through N73-15391.

N73-15370* Smithsonian Astrophysical Observatory, Cambridge, Mass.
AN OBSERVATIONAL PHILOSOPHY FOR GEOS-C SATELLITE ALTIMETRY
George C. Weiffenbach *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 9 p (For availability see N73-15369 06-13)
CSCL 08C

The parameters necessary for obtaining a 10 cm accuracy for GEOS-C satellite altimetry are outlined. These data include oceanographic parameters, instrument calibration, pulse propagation, sea surface effects, and optimum design. E.H.W.

N73-15371* National Ocean Survey, Rockville, Md.
REFINEMENT OF THE GEOID FROM GEOS-C DATA
Bernard H. Chovitz *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 8 p refs (For availability see N73-15369 06-13)
CSCL 08C

A refinement was made of ocean geoid and global gravity fields from GEOS-C altimeter data. Various mathematical procedures for calculating these phenomena are given. E.H.W.

N73-15372* National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
GROUND TRUTH DATA REQUIREMENTS FOR ALTIMETER PERFORMANCE VERIFICATION
Edward J. Walsh *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 9 p (For availability see N73-15369 06-13)
CSCL 08E

The amount and type of ground truth required for an altimeter experiment is a function of the uncertainty in the satellite orbit, the altimeter error budget and the type of operation being performed. Ground truth requirements will be discussed with reference to three areas of operation: the global mode, the high intensity mode and calibration. Author

N73-15373* Smithsonian Astrophysical Observatory, Cambridge, Mass.
USE OF ALTIMETRY DATA IN A SAMPLING-FUNCTION APPROACH TO THE GEOID
Charles A. Lundquist and G. E. O. Giacaglia (Tex. Univ., Austin) *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 9 p refs (For availability see N73-15369 06-13)
(Grant NGR-09-015-002; Contract N00014-67-A-0126-0013)
CSCL 08C

Problems associated with using an altimetry sampling function approach to the geoid are examined. They include: (1) convenient mathematical representation of short-wavelength (eventually approximately 1 deg) features of the geoid or geopotential, (2) utilization of detailed data from only part of the globe (i.e., the oceans) (3) application of appropriate formalism to relate the sea-level equipotential below the atmospheric mass to the external potential above the atmosphere, (4) mathematical applicability of an adopted geopotential representation on the surface of the physical geoid. Author

N73-15374* Battelle Columbus Labs., Ohio.
REQUIREMENTS FOR A MARINE GEOID COMPATIBLE WITH GEOID DEDUCIBLE FROM SATELLITE ALTIMETRY
D. Michael J. Fubara and A. George Mourad *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 38 p refs (For availability see N73-15369 06-13)
CSCL 08C

Theory deficiencies, data, and potential computational procedures that make the physical determination of the ocean geoid with true scale, shape, and absolute orientation of an elusive target are outlined. Satellite altimetry potential, in combination with adequate ground support and sea truth to resolve accurate global marine geoid and other peripheral benefits associated with ocean physics, are stated. Results are given in tabular form. Author

N73-15375* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SATELLITE HEIGHT DETERMINATION USING SATELLITE-TO-SATELLITE TRACKING AND GROUND LASER SYSTEMS **c30**
Fredrich O. Vonbun *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 13 p refs (For availability see N73-15369 06-13)
CSCL 22C

An attempt was made to use GEOS-C spacecraft height, as measured by the onboard radar altimeter, for an improved determination of the earth's gravitational field and for the determination of the variation of the physical surface of the oceans. Two tracking system approaches to accurately determine the spacecraft height (orbit) are described and their results stated. These are satellite-to-satellite tracking (SST) and ground-laser tracking (GLT). Height variations can be observed in the dm-regions using SST and in the m-region using present GLT. Author

N73-15376* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SATELLITE ALTITUDE DETERMINATION UNCERTAINTIES **c30**
Joseph W. Siry *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 31 p refs (For availability see N73-15369 06-13)
CSCL 22C

Satellite altitude determination uncertainties will be discussed from the standpoint of the GEOS-C satellite, from the longer range viewpoint afforded by the Geopause concept. Data are focused on methods for short-arc tracking which are essentially geometric in nature. One uses combinations of lasers and

collocated cameras. The other method relies only on lasers, using three or more to obtain the position fix. Two typical locales are looked at, the Caribbean area, and a region associated with tracking sites at Goddard, Bermuda and Canada which encompasses a portion of the Gulf Stream in which meanders develop. Author

N73-15377* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DESIGN CONSIDERATIONS FOR A SPACE-BORNE OCEAN SURFACE LASER ALTIMETER c16
Henry H. Plotkin *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 27 p refs (For availability see N73-15369 06-13)
CSCL 14B

Design procedures for using laser ranging systems in spacecraft to reflect ocean surface pulses vertically and measure spacecraft altitude with high precision are examined. Operating principles and performance experience of a prototype system are given. E.H.W.

N73-15378* Wolf Research and Development Corp., Riverdale, Md.
OPTIMUM USAGE OF GROUND STATIONS FOR GEOS-C ORBIT DETERMINATION c30
Chreston F. Martin *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 17 p refs (For availability see N73-15369 06-13)
(Contract NAS6-1942)
CSCL 22C

Effective utilization of data from the GEOS-C satellite for geoidal mapping was explored. Particular attention was given to the accuracy of orbits calculated from one revolution. Results show one revolution solutions are less affected by geopotential coefficient error than multi-revolution solutions. Data were taken from two global network tracking stations. E.H.W.

N73-15379* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRECISION TRACKING SYSTEMS OF THE IMMEDIATE FUTURE: A DISCUSSION c30
David E. Smith *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 9 p refs (For availability see N73-15369 06-13)
CSCL 22C

The present status and future expectations of four satellite tracking systems, satellite-to-satellite tracking, lasers, very long baseline interferometry (VLBI) and geoceiver are briefly discussed. Author

N73-15380* Naval Research Lab., Washington, D.C. E. O. Hulburt Center for Space Research.
RADAR PULSE SHAPE VERSUS OCEAN WAVE HEIGHT
Alan Shapiro, E. A. Uliana, and Benjamin Yaplee *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 29 p ref (For availability see N73-15369 06-13)
CSCL 08C

The radar height distribution of the vertical ocean surface structure was measured with a 1 ns radar system from a tower platform. It is shown that the reflecting properties of the ocean biases the mean sea level by about 5% of the significant wave height, and that the radar measured water wave height is reduced by about 6% of the significant wave height. For SWH up to 2 m, it can be assumed that the shape of the distribution is normal and that the mean sea level and water wave height of the observed ocean surface can be directly obtained from the convolved pulse, that is obtained from a high flying altimeter, with accuracies of a few centimeters. Measurements of higher sea states and utilization of an aircraft platform for pulse width limited observations are needed to confirm these preliminary results. Author

N73-15381* Research Triangle Inst., Durham, N.C.
CHARACTERISTICS OF OCEAN-REFLECTED SHORT RADAR PULSES WITH APPLICATION TO ALTIMETRY AND SURFACE ROUGHNESS DETERMINATION
Lee S. Miller and George S. Hayne *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 32 p (For availability see N73-15369 06-13)
CSCL 08C

Current work related to geodetic altimetry is summarized. Special emphasis is placed on the effects of pulse length on both altimetry and sea-state estimation. Some discussion is also given of system tradeoff parameters and sea truth requirements to support scattering studies. The problem of analyzing signal characteristics and altimeter waveforms arising from rough surface backscattering is also considered. Author

N73-15382* National Weather Service, Silver Spring, Md.
DATA REQUIREMENTS IN SUPPORT OF THE MARINE WEATHER SERVICE PROGRAM c20
J. Travers, Robert W. McCaslin, and M. Mull *In its* Sea Surface Topography from Space, Vol. 1 Feb. 1972 5 p (For availability see N73-15369 06-13)
CSCL 04B

Data support activities for the Marine Weather Service Program are outlined. Forecasts cover anomolous water levels, including sea and swell, surface and breakers, and storm surge. Advisories are also provided for sea ice on the Great Lake and Cook inlet in winter, and in the Bering, Chukchi, and Beaufort Seas in summer. Attempts were made to deal with ocean currents in the Gulf Stream, areas of upwelling, and thermal structure at least down through the mixed layer. E.H.W.

N73-15383* Lockheed Electronics Co., Houston, Tex. Earth Observations Dept.
THE COMPOSITE SCATTERING MODEL FOR RADAR SEA RETURN
Kumar Krishen *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 18 p (For availability see N73-15369 06-13)
CSCL 08C

A composite scattering model, suitable for explaining the behavior of measured scattering cross sections of the ocean surface, is presented. Furthermore, utilizing this scattering model, the spectrums of the small gravity, gravity-capillary, waves will be predicted for MSA/MSC, 13.3 GHz Scatterometer data. Author

N73-15384* New York Univ., N.Y. Dept. of Meteorology and Oceanography.
SKYLAB S193 AND THE ANALYSIS OF THE WIND FIELD OVER THE OCEAN c20
Willard J. Pierson, Jr. *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 20 p refs (For availability see N73-15369 06-13)
(Contracts NAS1-10090; N62306-70-A-0075-0007)
(Contrib-118) CSCL 04B

The present status of the program to provide proof of concept for the idea that simultaneously observed radar scattering cross section measurements and passive microwave measurements can be used to determine the winds in the planetary boundary layer over the ocean, is given. The role of S193 in Skylab is providing the final clinching proof that an operational instrument will obtain data of great value to both meteorology and oceanography is described. Author

N73-15385* Battelle Memorial Inst., Columbus, Ohio.
DETERMINATION OF MEAN SURFACE POSITION AND SEA STATE FROM THE RADAR RETURN OF A SHORT-PULSE SATELLITE ALTIMETER
Donald E. Barrick *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 19 p refs (For availability see N73-15369 06-13)
CSCL 08C

Using the specular point theory of scatter from a very rough surface, the average backscatter cross section per unit area per radar cell width is derived for a cell located at a given height above the mean sea surface. This result is then applied to predict the average radar cross section observed by a short-pulse altimeter as a function of time for two modes of operation: pulse-limited and beam-limited configurations. For a pulse-limited satellite altimeter, a family of curves is calculated showing the distortion of the leading edge of the receiver output signal as a function of sea state (i.e., wind speed). A signal processing scheme is discussed that permits an accurate determination of the mean

surface position--even in high seas--and, as a by-product, the estimation of the significant seawave height (or wind speed above the surface). Comparison of these analytical results with experimental data for both pulse-limited and beam-limited operation lends credence to the model. Such a model should aid in the design of short-pulse altimeters for accurate determination of the geoid over the oceans, as well as for the use of such altimeters for orbital sea-state monitoring. Author

N73-15386* National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
THE SKYLAB RADAR ALTIMETER c14
H. Ray Stanley and J. T. McGoogan *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 10 p refs (For availability see N73-15369 06-13)
CSCL 14B

A summary of the significant hardware characteristics of the S-193 altimeter experiment portion of the 1973 Skylab Mission is presented. A detailed discussion of the altimetry, oceanographic, and instrumentation technology objectives are presented along with a discussion of the major experiments associated with these objectives. Author

N73-15387* Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
GEOS-C RADAR ALTIMETER CHARACTERISTICS c14
J. Barry Oakes *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 10 p (For availability see N73-15369 06-13)
CSCL 14B

The purpose of the GEOS-C mission and the operating characteristics of its special K-band altimeter are outlined. Special attention was given to the possible use of height measurements and other supporting GEOS-C data to evaluate the feasibility and value of altimetry on a global basis. E.H.W.

N73-15388* Raytheon Co., Wayland, Mass. Equipment Div.
SATELLITE ALTIMETERS AFTER SKYLAB AND GEOS-C - SHOULD THEY UTILIZE A SINGLE TRANSMITTER OR AN ARRAY OF PULSED AMPLIFIERS? c14
Alan H. Greene and Edward F. Hudson *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 13 p refs (For availability see N73-15369 06-13)
CSCL 14B

An attempt was made to determine if future satellite altimeters, operating at K-band, should use a single transmitter or an array of pulsed amplifiers. The two systems were compared as a function of reliability, power, service life, system requirements, and weight. Preliminary results indicate the modular system to be superior in service life and reliability although it requires more power and is substantially heavier than the single system. No concrete conclusions were reached as to which system should be used. E.H.W.

N73-15389* Technology Service Corp., Silver Spring, Md. Washington Operations.
RADAR PULSE COMPRESSION AND HIGH RESOLUTION SEA REFLECTIVITY
Fred E. Nathanson *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 11 p refs (For availability see N73-15369 06-13)
CSCL 08C

The state-of-the-art in radar pulse compression as it applies to spacecraft altimetry is summarized. It is illustrated how in the next few years vertical resolutions to 0.5 to 2.0 ft. can be obtained with relative accuracies of 5 to 10% of these values if the nature of the sea surface is known. Data are also given that show when high accuracy is desired, second order effects such as the asymmetries in the sea surface reflectivity may be taken into account. Author

N73-15390* General Electric Co., Utica, N.Y. Aerospace Electronic Systems Dept.
ALTITUDE ERRORS ARISING FROM ANTENNA/SATELLITE ATTITUDE ERRORS - RECOGNITION AND REDUCTION c07
Thomas W. Godbey, Ron Lambert, and Gary Milano *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 24 p (For availability see N73-15369 06-13)
CSCL 17I

A review is presented of the three basic types of pulsed radar altimeter designs, as well as the source and form of altitude bias errors arising from antenna/satellite attitude errors in each design type. A quantitative comparison of the three systems was also made. E.H.W.

N73-15391* Tetra Tech, Inc., Pasadena, Calif.
FEASIBILITY OF MICROWAVE HOLOGRAPHY FOR IMAGING THE SEA SURFACE c16
Willard Wells *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 13 p (For availability see N73-15369 06-13)
CSCL 20E

The possibility of imaging the sea surface in three dimensions by means of microwave holography from a low-flying aircraft is considered. Data cover a brief feasibility study and a review of some computer experiments in which it was demonstrated that it is possible to compute three-dimensional images of objects from raw holographic data recorded on magnetic tape. These experiments used synthetic data. Author

N73-15392*# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
SEA SURFACE TOPOGRAPHY FROM SPACE, VOLUME 2
John R. Apel, ed. Boulder, Colo. May 1972 146 p refs Proc. of Conf. held at Key Biscayne, Fla., 6-8 Oct. 1971; sponsored jointly by NASA, NOAA, and Navy
(NASA-CR-129993; NOAA-TR-ERL-228-AOML-7-2-Vol-2) Avail: NTIS MF $0.95; SOD HC $1.25 CSCL 08C

The distortions that a dynamic moving ocean surface introduces on topographical sea surface measurements by orbiting satellite instrumentation are considered. For individual titles, see N73-15393 through N73-15396.

N73-15393* Lamont-Doherty Geological Observatory, Palisades, N.Y.
GRAVIMETRICALLY DETERMINED GEOID IN THE WESTERN NORTH ATLANTIC
Manik Talwani, Herbert R. Poppe, and Philip D. Rabinowitz *In* NOAA Sea Surface Topography from Space, Vol. 2 May 1972 34 p refs (For availability see N73-15392 06-13)
(Contracts N00014-67-A-0108-004; Nonr-266(79); Grants NSF GA-17761; NSF GA-27281)
CSCL 08C

A detailed gravimetric geoid for the western North Atlantic is obtained by correlating satellite-borne gravity measurements with topographical sea surface data to construct maps of free air gravity. G.G.

N73-15394* Rhode Island Univ., Kingston.
COMMENTS ON OCEAN CIRCULATION WITH REGARD TO SATELLITE ALTIMETRY
Wilton Sturges *In* NOAA Sea Surface Topography from Space, Vol. 2 May 1972 17 p refs (For availability see N73-15392 06-13)
CSCL 08C

Basic features of sea surface topography are reviewed, to show those oceanographic results which may be of value to a geodetic satellite program: (1) the shape and magnitude of the large scale features of the mean sea surface, relative to a level surface; (2) the position and magnitude of the slopes across the western boundary currents, from a variety of data; (3) an estimate of the position of the geoid, tied into the U.S. leveling network; and (4) a documented change of 60 to 70 cm in mean sea level, with respect to the geoid, between the U.S. east and west coasts. Author

N73-15395* Woods Hole Oceanographic Institution, Mass.
THE ENERGY BALANCE OF WIND WAVES AND THE REMOTE SENSING PROBLEM
Klaus Hasselmann *In* NOAA Sea Surface Topography from Space, Vol. 2 May 1972 55 p refs (For availability see N73-15392 06-13)
CSCL 08C

Measurements of wave growth indicate an energy balance of the wave spectrum governed primarily by input from the

atmosphere, nonlinear transfer to shorter and longer waves, and advection. The pronounced spectral peak and sharp low frequency cut-off characteristic of fetch-limited spectra are explained as a self-stabilizing feature of the nonlinear wave-wave interactions. The momentum transferred from the atmosphere to the wind waves accounts for a large part of the wind drag. These findings are relevant for remote microwave sensing of the sea surface by backscatter and passive radiometry methods. Author

N73-15396* National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
TIDES AND TSUNAMIS
Bernard D. Zetler *In its* Sea Surface Topography from Space, Vol. 2 May 1972 30 p (For availability see N73-15392 06-13)
CSCL 08C

Although tides and tsunamis are both shallow water waves, it does not follow that they are equally amenable to an observational program using an orbiting altimeter on a satellite. A numerical feasibility investigation using a hypothetical satellite orbit, real tide observations, and sequentially increased levels of white noise has been conducted to study the degradation of the tidal harmonic constants caused by adding noise to the tide data. Tsunami waves, possibly a foot high and one hundred miles long, must be measured in individual orbits, thus requiring high relative resolution. Author

N73-15397# National Physical Lab., New Delhi (India). Radio Science Div.
IONOSPHERIC DATA, JANUARY 1971
Jan. 1971 79 p refs
(RTRC-A188) Avail: NTIS HC $6.00

Tables of hourly values of propagation data for the E and F regions are presented. Author

N73-15398# National Physical Lab., New Delhi (India). Radio Science Div.
IONOSPHERIC DATA, FEBRUARY 1971
Feb. 1971 78 p refs
(RTRC-A189) Avail: NTIS HC $6.00

Tables of hourly values of propagation data for the E and F regions are presented. Author

N73-15399# National Physical Lab., New Delhi (India). Radio Science Div.
IONOSPHERIC DATA, MARCH 1971
Mar. 1971 79 p refs
(RTRC-A190) Avail: NTIS HC $6.00

Tables of hourly values of propagation data for the E and F regions are presented. Author

N73-15400# Institut d'Aeronomie Spatiale de Belgique, Brussels.
PLASMA SHEET PARTICLE PRECIPITATION: A KINETIC MODEL
J. Lemaire and M. Scherer 1972 23 p refs Submitted for publication
(A-N-109-1972) Avail: NTIS HC $3.25

Ionospheric and plasma sheet particle densities, fluxes and bulk velocities along an auroral magnetic field line have been calculated for an ion-exosphere model. It is shown that such a collisionless model accounts for many features observed above the auroral regions. Except for very strong plasma sheet electron precipitation, no large potential difference is needed along the magnetic field lines to account for the usual proton and electron fluxes, their pitch angle distributions, and auroral field aligned currents. Author

N73-15401# Defence Research Establishment Pacific, Victoria (British Columbia).
RECEPTION OF SANGUINE TEST TRANSMISSIONS, 1972, ADDENDUM
J. A. Shand, R. F. Sturrock, and J. E. Lokken Oct. 1972 14 p (Proj. 38-01-49)
(Rept-72-4-Add) Avail: NTIS HC $3.00

An experiment intended to confirm the validity of the method employed to predict magnetic field intensities, specifically at a range about 1000 km from the source of test transmissions, showed the measured and calculated values of both radial and tangential components to agree closely. Author

N73-15402# Universite Scientifique et Medicale de Grenoble (France).
MATHEMATICAL MODELS OF SNOWMELT: RESEARCH ON FORECASTING THE RISK OF AVALANCHE Ph.D. Thesis [MODELES MATHEMATIQUES DE LA FUSION NIVALE]
Charles Obled 28 Dec. 1971 185 p refs In FRENCH
Avail: NTIS HC $11.25

A critical analysis was made of the performance of a snowmelt model as well as a statistical analysis of variables used to formulate the model. Various procedures and instruments used to measure runoff from snowmelt are given along with meteorological charts. The second half of the study deals with forecasting avalanche risk, computer simulation of hydrological parameters, and a comparison of measured and predicted snowmelt. Transl. by E.H.W.

N73-15403# Universite Scientifique et Medicale de Grenoble (France).
EXPLANATORY MODELS OF PRECIPITATION AND SURFACE RUNOFF. HYDROLOGICAL AND STATISTICAL STUDY OF WATER COURSE DISCHARGE IN ISRAEL Ph.D. Thesis [MODELES EXPLICATIFS DE PRECIPITATION ET D'ECOULEMENT DE SURFACE. ETUDE HYDROLOGIQUE ET STATISTIQUE DU REGIME DES COURS D'EAU D'ISRAEL]
Milu Rosenberg 18 Jun. 1971 323 p refs In FRENCH
Avail: NTIS HC $18.25

The problems raised by the application of stochastic relations to hydrologic variables, and a method for solving such problems are examined. A regression analysis and linear multiple correlation was made of regional water flow patterns for Israel. Pluviometric correlations were made of the variability of a series of international precipitations, mean precipitation in a basin, and precipitation in relation to the physical characteristics of a region. Hydrological and statistical models of water course discharge and runoff are included. Transl. by E.H.W.

N73-15404# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON THE EXCITATION OF NATURAL OSCILLATIONS OF THE EARTH'S MAGNETIC TAIL
A. I. Ershkovich [1972] 5 p refs Transl. into ENGLISH from Geomagn. Aeron. (USSR), v. 12, no. 5, 1972 p 877-881
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill.

The amplitude is estimated of the natural electromagnetic oscillations of the geomagnetic tail excited by solar wind velocity changes. Based on the assumption that the tail is a plasma cylinder submerged in the interplanetary plasma, the dispersion equations for the oscillations were obtained. It is concluded that fluctuations in the solar wind parameters should result in periodic oscillations of the angle of aberration of the earth's magnetic tail. F.O.S.

N73-15405*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TRAPPED PARTICLES AT A MAGNETIC DISCONTINUITY
David P. Stern Dec. 1972 13 p refs Submitted for publication
(NASA-TM-X-66146; X-641-72-469) Avail: NTIS HC $3.00
CSCL 04A

At a tangential discontinuity between two constant magnetic fields a layer of trapped particles can exist; this work examines the conditions under which the current carried by such particles tends to maintain the discontinuity. Three cases are examined. If the discontinuity separates aligned vacuum fields, the only requirement is that they be antiparallel. With arbitrary relative orientations, the field must have equal intensities on both sides. Finally, with a guiding center plasma on both sides, the condition reduces to a relation which is also derivable from hydromagnetic theory. Arguments are presented for the occurrence of such trapped modes in the magnetopause and for the non-existence of specular particle reflection. Author

N73-15406# Joint Publications Research Service, Arlington, Va.
USING VIDEO PULSE SEQUENCING FOR SOUNDING SEA ICE
M. I. Finkelshteyn and V. A. Kutev 22 Dec. 1972 13 p refs Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow),

v. 17, no. 10, 1972 p 2108-2112
(JPRS-57841) Avail: NTIS HC $3.00

A method of sounding sea ice by means of a sequence of video pulses of nanosecond duration with a frequency of recurrence of the order of several tens of megahertz is reported. On the basis of the known electrical characteristics of sea ice, the shapes of signals reflected from the surfaces of various thickness and salinity are calculated. The results of a full scale experiment are given, which confirm calculations and prove the promising nature of the method under consideration. Author

N73-15407# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON THE INFLUENCE OF INHOMOGENEITY OF THE MAGNETIC FIELD ON OSCILLATIONS OF THE PLASMA LAYER OF THE MAGNETOSPHERE TAIL
A. I. Ershkovich and V. V. Kuzmin [1972] 3 p refs Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow), v. 12, no. 5, 1972 p 945-947
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The oscillations are considered of a plasma layer with converging lines of force in a small magnetic field normal to the plane of the neutral layer. Based on the assumptions that the plasma is inhomogeneous, perfectly conducting, and incompressible, a Laplace equation is obtained for finding perturbations proportional to the Alven velocity. It is shown that the characteristic periods of the oscillations are 1.5 to 2 hours, and approximately 10 minutes, respectively. The variations in the magnetic field observed on OGO-1 and Vela satellites indicate that these oscillations are natural. F.O.S.

N73-15408*# Scientific Translation Service, Santa Barbara, Calif.
GEOMETRICAL METHODS OF SPACE GEODESY
A. P. Tishchenko Washington NASA Dec. 1972 160 p refs Transl. into ENGLISH of the book "Geometricheskiye Metody Kosmicheskoy Geodezii" Moscow, Nauka Press, 1971
(Contract NASw-2035)
(NASA-TT-F-732) Avail: NTIS HC $3.00 CSCL 08E

The fundamental principles and geometrical origins of the development of coordinated geodetic grids and the methods of coordinate tie-in of fixed and moving objects from observations of artificial earth satellites are discussed. The topics discussed include: coordinate systems, motion of artificial earth satellites, reduction of satellite observations, and solution of geodetic problems by means of artificial earth satellites. F.O.S.

N73-15409# Bureau of Mines, Minneapolis, Minn.
DETERMINATION OF PALEOTECTONIC PRINCIPAL STRESS DIRECTION, INCLUDING ANALYSIS OF JOINTS BY OPTICAL DIFFRACTION
Robert C. Steckley 1972 21 p refs
(BM-RI-7706; LC-622.0617; TN23.U7) Avail: NTIS HC $3.25

A study of joints in Marathon County, Wis., was made to determine the orientation of regional paleotectonic stresses and to develop a method of using optical diffraction analysis (ODA) in studying joint orientations and spacings. Standard geologic and petrofabric techniques employing the use of a geologic compass and a Schmidt net were used in gathering, describing, and reducing joint orientation data. Analysis of selected outcrops with ODA indicates that ODA can be applied to study both joint orientations and spacings. The ODA is shown to be a rapid method that can be used to complement standard petrofabric techniques, especially in the study of joint spacings. Author

N73-15410*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE ACCURACY OF GEOPOTENTIAL SOLUTIONS FROM RESONANT SATELLITE DATA
C. A. Wagner Dec. 1972 45 p refs
(NASA-TM-X-66147; X-553-72-472) Avail: NTIS HC $4.25 CSCL 08G

Tracking data from a significant number of strongly resonant satellites have not yet been incorporated into recent comprehensive geopotential solutions. This data furnishes excellent comparative and absolute tests of these solutions for resonant coefficients of order (m) 2, 3, 4, 9 and 14. Tracking arcs of from 1 month to 6 years are examined on seven satellites of 1 rev/day, three of 2 revs/day, and one each of 9 and 14 revs/day. Current values for these fully normalized resonant coefficients as judged by this independent and sensitive data, range in accuracy from 2 x 10 to the minus 8th power to 5 x 10 to the minus 8th power. This represents an increase in accuracy by a factor from 3 to 5 over solutions current in the mid 1960's. Author

N73-15411*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EQUATORIAL RADIUS OF THE EARTH: A DYNAMICAL DETERMINATION
Mohammad Asadullah Khan Dec. 1972 16 p refs Sumitted for publication
(NASA-TM-X-66151; X-553-72-491) Avail: NTIS HC $3.00 CSCL 08F

An interesting variation on the familiar method of determining the earth's equatorial radius a sub e, from a knowledge of the earth's equatorial gravity is suggested. The value of equatorial radius thus found is 6378,142 + or - 5 meters. The associated parameters are GM = 3,986008 + or - 4 X 1014 cu cm/sec/sec which includes the relative mass of atmosphere approximately 0.000001 x GM, the equatorial gravity gamma sub e = 978,030.9 milligals (constrained in this solution by the Potsdam Correction of 13.67 milligals as the Potsdam Correction is more directly, or less indirectly, measurable than the equatorial gravity) and an ellipsoidal flattening of f = 1/298.255. Author

N73-15412# Pennsylvania State Univ., University Park. Ionospheric Research Lab.
CHANGES IN THE TOPSIDE IONOSPHERE IN THE LOW AND EQUATORIAL LATITUDE REGIONS DURING THE MODERATELY SEVERE MAGNETIC STORM EVENT OF 15-18 JUNE 1965
Y. V. Somayajulu and David G. Mack 5 Sep. 1972 58 p refs
(Grant NSF GA-5611)
(PSU-IRL-SCI-399; SR-399) Avail: NTIS HC $5.00

The behavior of the topside ionosphere in the low and equatorial latitudes during the moderately severe magnetic storm event of June 15-18, 1965, is reported based on an analysis of the electron density profiles derived from Alouette 1 ionograms. The detailed study of the electron density and scale height profiles, the electron density contours at fixed heights of 400, 600, and 800 km, and the field line distributions has led to the identification of the following changes during the storm event: (1) During the initial phase of the magnetic storm the equatorial anomaly is relatively unaffected; (2) changes in the equatorial anomaly structure become apparent after transition to the main phase; (3) the maximum change, occurs after the maximum of the main phase depression of the magnetic storm is fully developed; (4) the anomaly re-establishes itself during the recovery phase; and (5) the electron density profiles show a reduction of electron densities at higher altitudes. Author

N73-15413# Pennsylvania State Univ., University Park. Ionosphere Research Lab.
RECENT PROGRESS IN THE STUDY OF IONOSPHERIC STORMS
Y. V. Somayajulu 5 Sep. 1972 64 p refs
(Grants NSF GA-5611; NSF GA-27758)
(PSU-IRL-SCI-404) Avail: NTIS HC $5.25

A composite picture of ionospheric storms is presented. The relative importance of the various causative physical mechanisms and processes is discussed. The ionospheric parameters available for study and the observational techniques employed to measure them are described. A review of the significant results obtained on the topside ionosphere and outer ionosphere using space techniques and ground based incoherent scatter radar and whistler techniques is included. Author

N73-15414# National Research Council of Canada, Ottawa (Ontario).
THE EFFECT OF COLLISIONS AND MOTION ON THE TRANSFER IMPEDANCE OF A QUADRUPOLE PROBE IN THE VICINITY OF THE LOWER HYBRID RESONANCE IN THE IONOSPHERE
C. Beghin and C. Renard 1972 26 p refs Transl. into ENGLISH from the French book "Plasma Waves in Space and in the Laboratory, volume 2" Edinburgh Univ. Press, 1970 p 299-317

(NRC-TT-1614) Avail: NTIS HC $3.50

An attempt is made to predict the behavior in the ionosphere of the transfer impedance of a rocket-borne quadrupole probe near the lower hybrid resonance (LHR). First the basic equations are developed using the quasi-electrostatic hypothesis. Then the effects of electron-neutral and ion-neutral collisions are analysed. Finally the influence of the movement of the probe is studied. It is shown in this case that only the transverse component of the velocity relative to the earth's magnetic field affects the value of the transfer impedance. In conclusion it is pointed out that the LHR may be measured in the ionosphere using a quadrupole probe in spite of certain experimental difficulties. Author

N73-15415# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

INFORMATION RELATIVE TO CARTOGRAPHY AND SURVEYING. SERIES 1: ORIGINAL CONTRIBUTIONS [NACHRICHTEN AUS DEM . KARTEN- UND VERMESSUNGSWESEN. REIHE 1: ORIGINALBEITRAEGE]

1971 66 p refs In GERMAN

(Bull-56) Avail: NTIS HC $5.50

Papers on mathematical and automatic methods of cartography are presented. Cartographical rectification is described, and the properties of the resulting maps are determined. The principle of light-spot drawing using a light-spot projector unit is explained, and the accuracies and criteria for the representation of numbers, circles, and lines are derived. Methods based on the discrete Tchebycheff method are described for data reduction of digitized line elements by computer techniques. An information system and solutions to problems important to the automation of cartography are briefly mentioned. N.E.N.

N73-15416# Finnish Meteorological Inst., Helsinki.

RESULTS OF MAGNETIC MEASUREMENTS IN SOUTH AND EAST FINLAND, 1967 - 1971

C. Sucksdorff, M. Kivinen, and H. Nevanlinna 1972 25 p refs

(Rept-23) Avail: NTIS HC $3.25

Magnetic measurements of the total intensity F, horizontal intensity H, and declination D were made at 658 points in south and east Finland between 1967 and 1971. The points formed two lines running along the coast of the Gulf of Finland and the eastern border of Finland. The methods of measurements and reduction to the epoch are explained. Final values reduced to 1970.0 are presented. The accuracy of the measurements was found to be better than 10 gamma and 2 min and the representativeness of a measurement for the mean value of the surrounding area was found to be 100 gamma or 30 min or better. Author

N73-15417# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).

STANDARD CURVES FOR THE MAGNETIC ANOMALIES DUE TO SPHERES

J. E. Haigh 1972 33 p refs

(Bull-119) Avail: NTIS HC $3.75

Standard curves for interpretation of the magnetic anomalies due to spheres were derived. The anomalies in the vertical component, and the horizontal component in the direction of the traverse, are each found to be represented by a single family of curves. The horizontal component is found to be not represented by a single family, and separate curves for each field inclination and traverse azimuth are presented. Author

N73-15418# Edgerton, Germeshausen and Grier, Inc., Los Alamos, N.Mex.

GEOMETRIC AND RADIOMETRIC DATA REDUCTION FOR SECEDE 2 EVENTS, PLUM AND SPRUCE

J. R. Breedlove, Jr. and E. P. Marram 1 Dec. 1971 49 p refs

(Contract AT(29-1)-1183)

(EGG-1183-5006) Avail: NTIS

The results of data reduction of photographic records obtained for the PLUM and SPRUCE events conducted in January 1971 were given. The evolution of the PLUM and SPRUCE barium clouds as viewed along a direction parallel to the geomagnetic field are compared. Cloud dimensions, velocities, and ion cloud radiance are presented. Bounds on ion column densities for both events and estimates of ion inventories for SPRUCE are given. Both PLUM and SPRUCE developed in basically the same way although interesting differences in detailed structure and time scales are noted. Author (NSA)

N73-15419# Edgerton, Germeshausen and Grier, Inc., Las Vegas, Nev.

WATER EQUIVALENT OF SNOW MEASUREMENTS USING NATURAL TERRAIN RADIATION

A. E. Fritzsche, Z. G. Burson, and D. L. Burge 22 Oct. 1971 65 p refs

(Contract AT(29-1)-1183)

(EGG-1183-1533; L-1047) Avail: NTIS

Aerial survey data were obtained from repeated surveys of two snow courses during fiscal years 1970 and 1971. Both gross count and spectral peak counting techniques from NaI crystals were used. Analysis indicates that water equivalent can be predicted to an accuracy of plus or minus 0.9 cm or 6%, whichever is greater. These uncertainties can be further reduced by better delineation of the airborne radioactivity. Author (NSA)

N73-15420# California Univ., Livermore. Lawrence Livermore Lab.

EXAMINATION OF RAYLEIGH WAVES PRODUCED BY SHEAR AND COMPRESSIONAL LINE SOURCES

W. J. Hannon 2 Jun. 1972 50 p refs

(Contract W-7405-eng-48)

(UCRL-51233) Avail: NTIS

The response of a semi-infinite homogeneous medium to shear and compressional line sources is considered. Various energy and energy density functions are obtained from the expressions for the displacements as a function of time and position. Comparison of the results for the two sources indicates that the shear source is a better generator of Rayleigh waves than is the compressional source. Depending on the normalization used, a factor of from 3 to 30 is appropriate for Poisson's ratios typical of rocks. This suggests that the surface wave magnitude versus body wave magnitude discrimination technique used in seismic identification may be affected by the use of shaped cavities or other approaches which enhance the generation of shear waves by explosions. Author (NSA)

N73-15421# Oak Ridge National Lab., Tenn.

CATCH: COMPUTER ASSISTED TOPOGRAPHY, CARTOGRAPHY, AND HYPSOGRAPHY. PART 2: ORGRAT: A GENERAL SUBROUTINE FOR DRAWING GRATICULES

R. L. Stephenson Jul. 1972 21 p refs Sponsored in part by NSF

(Contract W-7405-eng-26)

(EDFB-IBP-72-7-Pt-2) Avail: NTIS

A subroutine has been written for drawing graticules (networks of latitude and longitude lines) using a 29.5-inch plotter. This program makes use of subroutines which accept latitude and longitude and return distance north and east in meters. Potentially the program can draw a graticule in any projection for which such subroutines are available. Author

N73-15422# Weapons Research Establishment, Salisbury (Australia).

UPPER ATMOSPHERE RESEARCH BIBLIOGRAPHY OF CONTAMINANT RELEASE EXPERIMENTS, PART 2

C. H. Low and K. H. Lloyd Oct. 1971 37 p refs

(WRE-TM-498(WR/D)-Pt-2) Avail: AEC Depository Libraries

A continuing bibliography on upper atmospheric contaminant release is presented. Data cover A10 spectra, No2 release, and instrumentation for measuring these phenomena. E.H.W.

N73-15423# Arbeitsgruppe fuer Physikalische Weltraumforschung, Freiburg (West Germany).

ROCKET OBSERVATIONS IN THE EQUATORIAL IONOSPHERE

E. Neske and R. Kist 1972 9 p Presented at the 15th COSPAR Plenary Meeting, Madrid, 15-24 May 1972

Avail: NTIS HC $3.00

A phase measuring type of swept radio frequency probe with dc biased sensor was flown twice at the same local time with a few days interval from French Guiana on the Veronique

rocket vehicle. Electron density profiles up to 210 km were determined and found to be different in shape between 130 and 180 km. while one profile shows an almost monotonous increase of electron density with height for low latitudes, the other shows a deep valley near 165 km. Data are compared with ionograms and are found to be compatible. The dc bias current can also be used to deduce profiles and this is found to agree with that determined by the pulse. The data permits an estimation of the relaxation time of the ion sheath when changing the bias potential. Author (ESRO)

N73-15424# Kiruna Geophysical Observatory (Sweden).
KIRUNA GEOPHYSICAL DATA: DATA SUMMARY 7214-6, APRIL-JUNE 1972
L. Liszka, ed. Jun. 1972 64 p Prepared jointly with European Space Sounding Rocket Range
Avail: NTIS HC $5.25

Data recorded at Kiruna, relating to geomagnetic variations and storms, earth currents, auroras, cosmic noise, and ionospheric absorption are presented. Measurements include geomagnetic K-indices, all-sky camera records, and vertical incidence ionospheric soundings. Magnetograms, riometer recordings, and routine ionograms from the down range station are reproduced. ESRO

N73-15425# Defence Research Establishment Ottawa (Ontario).
PRESENT ARCTIC GLACIATION
Geoffrey F. Hattersley-Smith Mar. 1972 38 p refs
(AD-747001; DREO-TN-72-7) Avail: NTIS CSCL 08/12

The review was written as a chapter of the book Arctic and Alpine Regions. It reviews glacier classifications, surveys glacier regimes and discusses their roles in terms of their effect on climate, the eco system and their contributions to geomorphology and possible future economic uses. Recent progress in various aspects of glacier research are reviewed. Author (GRA)

N73-15426# Transport and Road Research Lab., Crowthorne (England).
FLOW CHARTS FOR THE BRITISH STANDARD PARTICLE-SIZE DISTRIBUTION TESTS FOR SOILS
G. West and M. J. Dumbleton 1972 10 p refs
(PB-211721; TRRL-LR-468) Avail: NTIS HC $3.00 CSCL 08M

The report presents flow charts for the British Standard particle-size distribution tests for soils. The charts supplement the verbal description of the four tests given in British Standard 1377 by clearly showing the sequence of the many operations and decisions involved in each. They will be useful to engineers in soil testing laboratories, particularly during the training of staff. Author (GRA)

N73-15427# Utah State Univ., Logan. Electro-dynamics Labs.
LWIR (LONG WAVELENGTH INFRARED) ATMOSPHERIC TRANSMISSION MEASUREMENTS USING AIRCRAFT-BORNE INTERFEROMETRIC INSTRUMENTATION Final Report, 15 May 1970 - 15 Mar. 1972
Arthur Corman, Richard Higgins, and Ron Huppi 14 Apr. 1972 37 p refs
(Contract F19628-70-C-0249; AF Proj. 7670)
(AD-749876; AFCRL-72-0253) Avail: NTIS CSCL 04/1

The work performed under this contract consisted of the design and fabrication of a calibration system and a temperature control system to be installed on an airborne interferometer. A heliostat and interferometer system was calibrated and operated on-board a KC-135 research aircraft during several flights for the purpose of initial check out and in-flight testing. The data gathered were reduced to spectra for evaluation of the overall system performance. Author (GRA)

N73-15428# Aerospace Corp., El Segundo, Calif.
INTRINSIC BANDWIDTH OF CYCLOTRON RESONANCE IN THE GEOMAGNETIC FIELD Technical Report, Nov. 1971 - Apr. 1972
M. Schulz 15 Sep. 1972 15 p refs
(Contract F04701-72-C-0073)
(AD-750865; TR-0073(3260-20)-3; SAMSO-TR-72-235) Avail: NTIS CSCL 04/1

Equatorial resonance between electrons and VLF signals is characterized by an intrinsic bandwidth approximately 20 Hz at L = 3, owing to the inhomogeneity of B. The corresponding interaction time (approximately 50 msec) approximates the length of a Morse dot. Author (GRA)

N73-15429# Minnesota Univ., Minneapolis. School of Physics and Astronomy.
THE DISTRIBUTION OF ATMOSPHERIC OZONE DERIVED FROM OPTICAL EXTINCTION MEASUREMENTS
Homer T. Mantis Sep. 1972 28 p refs
(Contract N00014-67-A-0113-0004)
(AD-750404) Avail: NTIS CSCL 04/1

Simultaneous measurements of the ozone profile and the solar extinction in the Chappuis bands have been used to obtain an absorption coefficient for calculating the ozone distribution from extinction measurements. The absorption coefficient was found to exhibit line absorption characteristics, but at moderate absorber paths, the absorption coefficient varied only slowly so that satisfactory ozone profiles can be obtained in the atmosphere below the balloon. At short absorber paths uncertainties in the absorption coefficient restricted the accuracy of the ozone calculation but the observations do detect a variation in the ozone concentration above the balloon from sunrise to sunset. Author (GRA)

N73-15430# Illinois Univ., Urbana. Aeronomy Lab.
COSPAR SYMPOSIUM ON D AND E-REGION ION CHEMISTRY - AN INFORMAL SYMPOSIUM RECORD Final Report
C. F. Sechrist, Jr., ed. and M. A. Geller, ed. 1 Jun. 1972 462 p refs Proc. of Symp. held at Urbana, Ill., 6-8 Jul. 1971
(Contract DAAD05-69-C-0102)
(AD-749780; Aeronomy-48; UILU-ENG-72-2503) Avail: NTIS CSCL 04/1

Presented are the papers given at the symposium and the discussions on them. The topic was on aspects of the neutral and ion chemistry of the lower ionosphere. The importance of improved information on the height distributions of minor neutral constituents was emphasized. The role of model calculations was discussed. The importance of metastable states in the production of ionization was stressed and the relative importance of particle precipitation, Lyman-alpha, and Lyman-beta sources of ionization was not resolved. The importance of precipitating particles as a source of ionization in the nighttime lower ionosphere at middle latitudes was also discussed. The observations of positive water-cluster ions were reported. In the session on electron density profiles, it was evident that the winter anomaly in the lower ionosphere remains unexplained. GRA

N73-15431# Scripps Institution of Oceanography, San Diego, Calif. Marine Physical Lab.
GEOMAGNETIC TIME VARIATIONS ON THE SEA FLOOR OFF SOUTHERN CALIFORNIA
John P. Greenhouse 1 Aug. 1972 240 p refs
(Contract N00014-69-A-0200-6002; Grant NSF GP-425)
(AD-749931; SIO-Ref-72-67; MPL-U-41/71) Avail: NTIS CSCL 08/10

Data from 12 geomagnetic stations on the sea floor off southern California have been analyzed to infer the structure of electrical conductivity within the oceanic basement. The best fitting conductivity model has a significantly lower conductivity within the basement than that inferred by Cox and others from magnetotelluric measurements. Author (GRA)

N73-15432# Dabcovich and Co., Inc., Bedford, Mass.
PROJECTS IN SOLAR ECLIPSE PREDICTION, IONOSPHERIC REFLECTION PROPERTIES, IONOSPHERIC D-REGION DATA REDUCTION, AND MICROWAVE ACOUSTICS Final Report, 20 Mar. 1970 - 19 Jun. 1972
Kenneth Dieter, John V. OBrien, and Leo A. Whelan, Jr. Jun. 1972 124 p refs
(Contract F19628-70-C-0237)
(AD-749882; AFCRL-72-0383) Avail: NTIS CSCL 04/1

The report describes analysis and programming projects in astronomy, ionospheric physics, and microwave acoustics. Author (GRA)

N73-15433# Kiruna Geophysical Observatory (Sweden).
OBSERVATIONS OF BEACON TRANSMISSIONS FROM SATELLITES INTELSAT 2F-1 AND 2F-2 Summary Scientific Report, 1 Apr. - 30 Jun. 1972
Ludwik Liszka 4 Aug. 1972 40 p refs
(Contract F61052-61-C-0026; AF Proj. 4643)
(AD-750469; AFCRL-72-0532) Avail: NTIS CSCL 04/1

Beacon transmissions from the semi-geostationary satellite Intelsat 2F-1 and the geostationary satellite Intelsat 2F-2 are used for studies of the high latitude ionosphere. Summer-daytime latitudinal variations of the electron content, geomagnetic storm effects and unusual propagation effects in the subauroral zone ionosphere are studied. Author (GRA)

N73-15434# Defense Mapping Agency Aerospace Center, St. Louis, Mo.
EXPRESSION OF THE QUASIGEOID HEIGHTS AND DEFLECTIONS OF THE VERTICAL FOR THE REFERENCE FIELD OF THE LEVEL ELLIPSOID Technical Translation Branch.
V. F. Eremeev and M. I. Yurkina Aug. 1972 14 p Transl. into ENGLISH from Tr. Tsent Nauch.-issled. Inst. Geod. Aerosemki i Kartografii (USSR), 1971 11 p
(AD-748528; DMAAC-TC-1837) Avail: NTIS CSCL 08/5

The present article describes the practical methods of solution to Molodenskiy's problem. The solution uses the integral equation for the density of a single layer and the corresponding formulas for the heights of the quasigeoid and the deflections of the vertical. Author (GRA)

N73-15435# Teledyne Geotechnical, Alexandria, Va.
SEISMIC ARRAY ANALYSIS CENTER Quarterly Technical Summary Report, Apr. - Jun. 1972
H. Mack 25 Jul. 1972 12 p
(Contract F33657-72-C-0471; ARPA Order 1620)
(AD-750779) Avail: NTIS CSCL 17/10

The report summarizes the operations and accomplishments in the Seismic Array Analysis Center for the period of April, May and June 1972. GRA

N73-15436# General Electric Co., Santa Barbara, Calif. DASA Information and Analysis Center.
REACTION RATE DATA, NO. 34
May 1972 35 p
(Contract DASA01-70-C-0035)
(AD-750771) Avail: NTIS CSCL 07/4

The issue of the DASIAC Reaction Rate Data presents summaries of recent progress reports and other informal information of current interest in the reaction rate field related to aeronomy studies. GRA

N73-15437# Aerospace Corp., El Segundo, Calif. Lab. Operations.
DRIFT-SHELL SPLITTING BY INTERNAL GEOMAGNETIC MULTIPOLES Technical Report, Jan. - May 1972
Henry H. Hilton, Michael Schulz, and Juan G. Roederer 25 Sep. 1972 43 p refs
(Contract F04701-72-C-0073)
(AD-750741; TR-0073(3260-20)-4; SAMSO-TR-72-234) Avail: NTIS CSCL 04/1

Computations on an 80-coefficient model of the earth's field illustrate the topography of the magnetic equatorial surface on which (B dot del B = 0) and the geometry of the drift shells of geomagnetically trapped particles. Individual terms in the spherical-harmonic expansion (offset-dipole coordinates) of the geomagnetic scalar potential V(r, theta, phi) are either even or odd in cos theta, where theta – pi/2 denotes the dipole equator. Terms that (unlike the dipole) are even in cos theta tend to warp the equatorial surface, but do not (in first order) distort particle drift shells radially nor split the drift shells of particles having different equatorial pitch angles. Azimuthally asymmetric terms that are odd in cos theta do cause shell splitting in first order. Shell splitting at large L values (neglecting deformation of the earth's field by the solar wind) is found to be dominated by the geomagnetic octupole. At L about – 1, shell splitting is strongly enhanced by the South American and South African anomalies. When combined with pitch-angle diffusion caused by atmospheric scattering, these results may be able to account for anomalous radial diffusion of inner-zone electrons. Author (GRA)

N73-15438# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
THE TIME DEPENDENCE OF THE TRAPPED PROTON ENERGY SPECTRUM AT LOW ALTITUDES Physical Sciences Research Papers
Zachary OFriel and Robert C. Filz 15 Jun. 1972 18 p refs
(AD-750474; AFCRL-72-0397; AFCRL-PSRP-498) Avail: NTIS CSCL 04/1

The authors measure the energy spectra of high energy trapped protons utilizing nuclear emulsions exposed on low altitude polar orbiting satellites. The spectra are compared with those obtained by Heckman and Nakano (1969) at solar minimum and the effects of solar cycle atmospheric density changes are evaluated. Author (GRA)

N73-15439# Texas Instruments, Inc., Dallas. Services Group.
EXTENDED ARRAY EVALUATION PROGRAM Quarterly Report, 1 Apr. - 30 Jun. 1972
Terence W. Harley 15 Jul. 1972 17 p ref
(Contract F33657-72-C-0725; ARPA Order 1714; AF Proj. 2705; Proj. Vela)
(AD-750759; QR-1) Avail: NTIS CSCL 17/10

The first quarterly report summarizes progress under the extended evaluation of the ALPA, NORSAR, and LPE program. Work through 30 June 1972 in the following areas is summarized: ALPA evaluation; NORSAR long period evaluation; NORSAR short period evaluation; LPE evaluation; Network analysis. GRA

N73-15440# Ohio State Univ., Columbus. Dept. of Geodetic Science.
ADVANCED LEAST-SQUARES METHODS
Helmut Moritz Jun. 1972 137 p refs
(Contract F19628-72-C-0120; AF Proj. 8607)
(AD-749873; DGS-175; AFCRL-72-0363; SR-1) Avail: NTIS CSCL 08/5

A general least-squares method (collocation) which encompasses, as special cases, least squares adjustment and least-squares prediction, is presented in detail and applied to various problems occurring in geodesy and photogrammetry, such as interpolation and coordinate transformation. In particular, this method permits an optimal simultaneous determination of geodetic positions and of the terrestrial gravity field by combining different data of any kind--terrestrial angle, distance and gravity measurements as well as data from advanced satellite techniques. To provide an adequate statistical background, an alternative statistical interpretation of the anomalous gravity field in terms of covariance analysis of individual functions is given, and its relation to the usual interpretation as a stochastic process on the sphere is discussed. Author (GRA)

N73-15441# Lamont-Doherty Geological Observatory, Palisades, N.Y.
SEA FLOOR GEOTHERMAL MEASUREMENTS FROM CONRAD CRUISE 13 Technical Report, Apr. - Dec. 1970
Charles A. Bookman, Isabel E. Malone, and Marcus G. Langseth, Jr. Jul. 1972 278 p refs
(Contract N00014-67-A-0108-0004; Grants NSF GA-18765; NSF GA-27281)
(AD-749983) Avail: NTIS CSCL 08/10

The report presents geothermal data representing 127 stations in the Atlantic and Pacific Oceans. This material includes deep water and sediment temperatures as well as conductivity measurements from sediment cores. Author (GRA)

N73-15442# Army Electronics Command, Fort Belvoir, Va. Night Vision Lab.
NIGHT-SKY RADIANT STERANCE FROM 450 TO 2000 NANOMETERS
Mishri L. Vatsia, U. Karl Stich, and Douglas Dunlap Sep. 1972 42 p refs
(DA Proj. 1S6-62709-D-617)
(AD-750609; ECOM-7022) Avail: NTIS CSCL 04/1

A ground-based, 3-channel Fourier spectroradiometer with a wave-number resolution of 250/cm was used to measure night-sky spectral radiant sterance (radiance) in the 450-nm to

2000-nm wavelength region. The experimental sites were remote locations in Panama, United States, and Canada. Details of night-sky radiation measuring system, calibration equipment, and procedures for data acquisition and analysis are presented. A large number of night-sky radiant sterance spectra recorded under various types of nighttime meteorological environments and moon phases are presented. The results are compared to measurements reported in the literature. The night-sky radiant sterance spectra presented in this work are unique in two respects: They cover the wide wavelength region from 450 nm to 2000 nm; and They were recorded under a large variety of nighttime, atmospheric, optical environments. Author (GRA)

N73-15443# Army Electronics Command, Fort Belvoir, Va. Night Vision Lab.
ATMOSPHERIC OPTICAL ENVIRONMENT
Mishri L. Vatsia Sep. 1972 123 p refs
(AD-750610; ECOM-7023) Avail: NTIS CSCL 04/1

A knowledge of the fundamental optical properties of the terrestrial atmospheric environment is essential for solving various problems in the multidisciplinary field of Visionics including the areas of vision, psychology, atmospheric physics, infrared physics, simulation, astrogeophysics, and electro-optical technology. The aim of the report is to generalize the recent work of the author and summarize the data from other worldwide sources published by the first quarter of the year 1972. The report included a treatment of the atmospheric radiation, the atmospheric transmission, and the transfer of contrast by the atmosphere. The fundamental characteristics of the daytime and nighttime radiation including some important recent measurements of the solar, twilight, and nightglow radiation spectra are presented. An extensive chapter on atmospheric transmission includes the fundamental properties of the terrestrial atmosphere and basic principles of atmospheric absorption and scattering. A fairly complete collection of the most important data on atmospheric transmittance in the 0.4 micrometer to 15 micrometers spectral region is presented. The effects of atmospheric turbulence on the propagation of imagery are described. A detailed analysis of the transfer of contrast by the atmosphere is presented, and its significance on the performance of electro-optical devices is emphasized. Author (GRA)

N73-15444# Naval Civil Engineering Lab., Port Hueneme, Calif.
LOBSTER AND FMS: DEVICES FOR MONITORING LONG TERM SEAFLOOR FOUNDATION BEHAVIOR Technical Report, Jul. 1967 - Mar. 1972
H. G. Herrmann, K. Rocker, Jr., and P. H. Babineau Sep. 1972 74 p refs
(AD-750258; NCEL-TR-775) Avail: NTIS CSCL 13/10

The report describes the development and evaluation of two devices for monitoring long-term seafloor foundation settlement and tilting. The LOBSTER(Long-Term Ocean Bottom Settlement Test for Engineering Research) is an instrumented foundation used as a test device, whereas the FMS(Foundation Monitor System) is an instrument that can be attached to any seafloor foundation to be monitored. Data and preliminary analysis are presented from successful foundation deployments for periods of up to 1 year at water depths of 4, 120, 600, and 1,200 feet in the Santa Barbara Channel area of the Pacific Ocean. The analysis presented includes data from an extensive laboratory program of core analysis and consolidation testing.
Author (GRA)

N73-15445# Naval Postgraduate School, Monterey, Calif.
DEVELOPMENT OF REGIONAL EXTREME MODEL ATMOSPHERES FOR AEROTHERMODYNAMIC CALCULATIONS, 1
Frank L. Martin 20 Oct. 1972 44 p refs
(AD-750170; NPS-51MR72101A) Avail: NTIS CSCL 04/1

A group of stations in the North American Arctic region have been analyzed for statistical determination of temperatures at mandatory pressure levels pj. For each station the temperature at a key level (called the forcing-level temperature) peculiar to the station has been forced in at the first step, and retained at each subsequent step in the development of the stepwise regression equations giving temperature at the mandatory levels. In general, eight-step prediction equations in terms of other temperatures in the vertical were found to give specification of T(pj), with percentage explained variance of close to 0.99. As a result of this definitive property, the best-estimate of the regional atmosphere which is conditionally dependent upon the existence of an extreme 1% probability of the forcing-level temperature is obtained with a high degree of confidence. Author (GRA)

N73-15446# Deutscher Wetterdienst, Hohenpeissenberg (West Germany). Meteorologisches Observatorium.
RESULTS OF AEROLOGICAL OZONE SOUNDINGS AT THE HOHENPEISSENBERG METEOROLOGICAL OBSERVATORY Semiannual Report, Jan. - Jun. 1972
Walter Attmannspacher Sep. 1972 146 p
(Contract DAJA37-71-C-3347)
(AD-750166; SAR-3) Avail: NTIS CSCL 04/1
Contents: Ozone tables, ozonagrams; Ascent tables. GRA

N73-15447# Naval Ordnance Lab., White Oak, Md.
THE DEPTH PROFILE OF AMBIENT NOISE IN THE DEEP SEA NORTH OF ST. CROIX, VIRGIN ISLANDS
R. J. Urick, G. R. Lund, and T. J. Tulko 14 Aug. 1972 31 p refs
(AD-750693; NOLTR-72-176) Avail: NTIS CSCL 20/1

The deep sea appears to be quieter at mid-depth than at greater or lesser depths. This was found in a series of measurements of the ambient noise background at a location north of St. Croix, V.I., using hydrophones suspended from a cable at intervals of 2000 feet down to 8100 feet. The noise profiles show a sharp decrease of noise from the surface down to 6100 ft and a reversal of the profile below. The measurement site is an active, dynamic one, and shows a large variability in noise level from hour to hour. Author (GRA)

N73-15448# Pennsylvania State Univ., University Park. Ionosphere Research Lab.
AN INVESTIGATION OF D-REGION IONIZATION DURING A POLAR CAP ABSORPTION EVENT 2 Final Report
Leslie C. Hale Aug. 1972 31 p refs
(Contract DAAD05-69-C-0336)
(AD-750570; PSU-IRL-FR1; BRL-CR-74) Avail: NTIS CSCL 04/1

Data are presented for parachute-borne blunt probe, charged particle, conductivity measurements during a PCA, covering a night-sunrise-day sequence of four shots on November 3, 1969 at Ft. Churchill, Manitoba. The measured conductivities show that the effects of the PCA on ionization persists down to about 30 km. A description of the propagation experiment flown with the blunt probe is presented. Author (GRA)

N73-15449# Aerospace Corp., El Segundo, Calif. Space Physics Lab.
RADIAL DIFFUSION OF IONIZED HELIUM AND PROTONS: A PROBE FOR MAGNETOSPHERIC DYNAMICS Research Report, Jun. 1970 - Jan. 1972
John M. Cornwall 15 Sep. 1972 56 p refs
(Contract F04701-72-C-0073)
(AD-750861; TR-0073(3260-20)-1; SAMSO-TR-72-238) Avail: NTIS CSCL 04/1

The comparison of radial diffusion of magnetospheric helium ions and protons is a sensitive test of the diffusion process assumed (magnetic or electrostatic fluctuations) and thus valuable as a probe of magnetospheric dynamics for protons, electrons, and heavy ions, as well as for the helium ions themselves. In the paper, radial profiles of ionized helium flux and protons were calculated, taking into account certain physical effects ignored in previous treatments. These include: (1) charge exchange processes (He(--) yields He(-) yields He or He(--)) which provide a loss mechanism as well as a way of converting solar wind alpha particles to He(-); (2) contribution of fluctuating electrostatic fields to the radial diffusion coefficient. Author (GRA)

N73-15450# Wayne State Univ., Detroit, Mich. Research Inst. for Engineering Sciences.
STUDIES OF ATMOSPHERIC PROCESSES Semiannual Technical Report
Frederick P. Boynton, Edward R. Fisher, Ralph H. Kummler, and Pieter K. Rol 15 Jun. 1972 38 p refs
(Contract F19628-72-C-0007; ARPA Order 1856; AF Proj. 8692)
(AD-750878; AFCRL-72-0453; SATR-2) Avail: NTIS CSCL

04/1

The research described in this report is aimed at characterizing the non-equilibrium flow and coupled chemistry associated with the interaction of rocket exhaust effluents in the upper atmosphere. Infrared chemiluminescence emitted from the reaction between O and C2H4 has been quantitatively measured under lean conditions. The ratio of the rate coefficients for the reactions CHO + O to CO + OH* and CHO + O2 to CO + HO2 was found. The rate coefficient for the reaction CH2O + O to CHO + OH was also determined.. A compilation of all available cross section information is included herein for use in highly rarefied plume calculations. The molecular beam measurements on the interaction potential between O atoms and plume species are described. Author (GRA)

N73-15451# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SOME RESULTS FROM EXPERIMENTAL INVESTIGATIONS OF TURBULENCE IN THE TROPOSPHERE AND STRATOSPHERE

N. Z. Pinus and G. N. Shur 1 Sep. 1972 33 p refs Transl. into ENGLISH from Beitr. Geophysik (Leipzig), v. 79, no. 5, 1970 p 363-378

(AD-750514; FTD-HC-23-538-72) Avail: NTIS CSCL 04/1

After introductory comments on the significance of turbulence research in terms of modern aviation, the authors investigate the character of turbulence on the scales concerned here. The sources and depressions of turbulent energy as well as the forms of energy spectra are discussed here in connection with various atmospheric conditions. On the basis of aircraft observations, data is presented on the appearance and character of turbulence in the stratosphere and on the level of the tropopause. Finally, the results are given for a statistical investigation of the tie-in between turbulence and macrosynoptic processes, from which a synoptic-statistical method for the prediction of clear-air turbulence is derived. Author (GRA)

N73-15452# Translation Consultants, Ltd., Arlington, Va.

ATLAS OF VARIATIONS IN THE OCEAN-ATMOSPHERE SYSTEM IN THE NORTH ATLANTIC. ISSUE 6: SEASONAL VARIATIONS IN TIDAL PHENOMENA AND INTERNAL WAVES

L. I. Boris 26 May 1972 260 p refs Transl. into ENGLISH of the publ. "Atlas Izmenenii Sostoyaniya Sistemy Okean-atmosfera v Severnoi Atlantike. Vypusk 6: Sezonnye Izmeneniya Prilivnykh Yavlenii i Vnutrennikh Voln" Moscow, Hydrometeorological Publishing House, 1970

(Contract N62306-72-M-1386)

(AD-750842; NOO-Trans-45) Avail: NTIS CSCL 08/3

Computations of seasonal variations in internal waves and tidal phenomena in the northern Atlantic Ocean are presented. The calculations are made for tides using Hansen's equations assuming a homogeneous ocean and for internal waves using the method suggested by Fjeldstad. Then variations in vertical density were incorporated in the calculations to provide preliminary information on tidal phenomena in an inhomogeneous ocean. Computations based on a theoretical model were modified and checked using direct observations. Charts show tides and tidal currents for average astronomical conditions based on a homogeneous ocean, characteristic seasonal curves for internal waves, and currents associated with tides and internal waves. Author (GRA)

N73-15453# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.

ON ONE METHOD OF RELIEF REPRESENTATION AND THE POSSIBILITY OF AUTOMATING IT

A. I. Martynenko and P. A. Shcherbakov Sep. 1972 17 p refs Transl. into ENGLISH from Geod. Kartografiya (USSR), no. 1, 1972 p 52-58

(AD-750750) Avail: NTIS CSCL 08/2

The paper contains a presentation of a simple practical method to automate and represent relief drawings. The method provides automatic engraving of contour lines with thickening of the lines in the lightest and darkest places. A method of drawing contour lines with a laser beam on a photographic base is discussed, along with its drawbacks and advantages. Author (GRA)

N73-15454# Informatics, Inc., Rockville, Md.

RECENT SOVIET INVESTIGATIONS IN GEOTHERMY

Eleanor M. Rowell and Stuart G. Hibben May 1972 91 p refs

(Contract F44620-72-C-0053; ARPA Order 1622)

(AD-750128; AFOSR-72-1959TR; Rept-1) Avail: NTIS CSCL 08/7

The report presents the results obtained in an attempt to provide information on recent Soviet research on geothermy. Emphasis is on the identification and description of high-intensity heat flow areas in the USSR that have or might become potential sites for geothermal power or space heating developments. In general, the information provided consists of background data (geographical, geological and chemical) covering recently investigated areas. Author (GRA)

N73-15455# Teledyne Geotechnical, Alexandria, Va. Seismic Data Lab.

SPECTRAL WHITENING WITH APPLICATION TO EXPLOSION

T. J. Cohen, R. L. Sax, and H. L. Husted 12 Jan. 1972 81 p refs

(Contract F33657-72-C-0009; ARPA Order 1714)

(AD-750781; SDL-282) Avail: NTIS CSCL 17/10

A method is proposed for whitening the spectra of teleseismic P waves to aid in the determination of event depths. The method uses a network of common recording stations, all of which must have recorded signals from a suite of closely-spaced events, e.g., a set of underground explosions. Individual spectra are whitened by removing a path-recording site response determined by averaging spectra from the suite of events as recorded at a single station. The whitened spectra from a single event are then summed over the recording network to yield whitened source spectra. The whitening process enhances spectra components in the band 2 to 5 Hz. Author (GRA)

N73-15456# Mount Auburn Research Associates, Inc., Newton Upper Falls, Mass.

COMPUTATION OF ION COLLECTION BY A LARGE ROCKET-MOUNTED MASS-SPECTROMETER PLATE AT A LARGE DRAWING IN POTENTIAL Final Report, 28 Apr. 1971 - 30 Jun. 1972

Lee. W. Parker 30 Sep. 1972 51 p refs

(Contract F19628-71-C-0200; AF Proj. 6687)

(AD-750483; AFCRL-72-0524) Avail: NTIS CSCL 04/1

Calculations of the ion current density at the central point of a charged mass-spectrometer plate mounted on a rocket were extended into the regime of very small Debye lengths. Since self-consistent solutions are numerically difficult to obtain in this regime (especially for large dimensionless drawing-in potentials), the investigation was carried out with the aid of a linearized-space-charge model. Use of the model provides a potential distribution characterized by a Debye-length-like parameter lambda(H). The nature of the ion trajectories in the strong electric field is studied, and correlations between lambda(H) and the true Debye length are discussed. Author (GRA)

N73-15457# St. Louis Univ., Mo. Dept. of Earth and Atmospheric Sciences.

RESEARCH IN SEISMOLOGY

Carl Kisslinger and Otto W. Nuttli 31 Jul. 1972 8 p refs

(Contract F19628-70-C-0036; ARPA Order 0292; AF Proj. 8652)

(AD-749874; AFCRL-72-0405) Avail: NTIS CSCL 08/11

The report concerns research related to the discrimination between small-magnitude earthquakes and explosions. The principal findings are: The source spectra of small-magnitude earthquakes in the New Madrid (Lower Mississippi Valley) seismic region can be divided into two classes, one of which is deficient in low-frequency energy. In most cases the source spectrum of P waves from deep-focus South American earthquakes is flat at the low frequencies and falls off as the inverse square of the frequency at the high frequencies. The absorption of surface waves is much smaller east of the Rocky Mountains than west of them. This fact must be taken into account when computing surface-wave magnitudes of small events. Author (GRA)

N73-15458# Tetra Tech, Inc., Pasadena, Calif.
WAVE INDUCED CIRCULATION AND LONGSHORE CURRENT PATTERNS IN THE COASTAL ZONE
Edward K. Noda Sep. 1972 108 p refs
(Contract N00014-69-C-1017)
(AD-750291; TETRAT-P-72-149-3; TT-TC-149-3) Avail: NTIS CSCL 08/3

The report presents a theoretical analysis on the generation and stabilization of nearshore, wave-induced circulation and longshore current patterns produced by the interaction of the incoming waves and local bottom topography. This interaction results in a spacial variation of wave characteristics which produces the driving mechanism for nearshore circulation patterns. Both normal and oblique wave incidence are considered with the imposed beach profiles developed from an examination of prototype data. The analytical model results are compared to field measurements and yield optimistic results. Author (GRA)

N73-15459# Scripps Institution of Oceanography, San Diego, Calif. Marine Physical Lab.
PRELIMINARY CRUISE REPORT - IGUANA EXPEDITION
George G. Shor, Jr. and Stuart M. Smith 1 Oct. 1972 36 p
(Contract N00014-69-A-0200-6002; Grant NSF GA-19703; NR Proj. 260-103)
(AD-750679; SIO-Ref-72-76; MPL-U-65/72) Avail: NTIS CSCL 08/10

A preliminary cruise report of Expedition Iguana, 31 March 1972 - 11 May 1972, gives some preliminary results, list of equipment and personnel, stations and data gathered, and track and topographic plots. Author (GRA)

N73-15460# Army Engineer Topographic Labs., Fort Belvoir, Va.
ACCURATE EPHEMERIS TIME DETERMINATION AND GEOCENTRIC STATIONS POSITION FROM PHOTOGRAPHS OF THE MOON AGAINST STELLAR BACKGROUND
Angel A. Baldini 1972 16 p
(AD-750307) Avail: NTIS CSCL 08/5

The investigation is done by strictly geometrical methods. Accurately recorded timecorrelated moon and star images on photographic plates allow one to obtain the apparent direction to the moon in terms of the celestial right ascension and declination system. GRA

N73-15461# Alaska Univ., College. Geophysical Inst.
CRUSTAL DEFORMATION PROPAGATION Final Report
Eduard Berg Sep. 1972 57 p refs
(Contract F44620-71-C-0105; ARPA Order 1827)
(AD-750468; UAG-R-222; AFOSR-72-1977TR) Avail: NTIS CSCL 08/11

Tilt steps similar to strain steps have been observed for earthquakes with magnitudes ranging from 2 to 8 and distances ranging anywhere from 10 km to 12,600 kilometers. Tilt-step propagation velocities from the hypocenter to the station have been observed from 1.2 to 3.8 km/sec, and those corresponding to the arrival time of teleseismic S waves. Tilt directions, amplitudes and velocities observed at several stations simultaneously for the same earthquake are internally consistent and are likely to depend on the tectonic environment of the station in addition to the focal mechanism. The low velocity of 1.2 km/sec is consistent with a plastic wave propagation. Other velocities are close to the Rayleigh wave short-period group velocity over continental paths. Author (GRA)

N73-15462# East Tennessee State Univ., Johnson City. Remote Sensing Inst.
AN EVALUATION OF THE UTILITY OF AVAILABLE REMOTE SENSOR RETURNS FOR A STUDY OF SLOPE FAILURE PHENOMENA
Donald H. Poole 1971 40 p
(Contract N00014-67-A-0102-0001)
(AD-750735; TR-14) Avail: NTIS CSCL 08/6

The object of this investigation is to evaluate the utility of the photographs from NASA's North Carolina Test Site 46 for studying slope failure phenomena. Slope failure forms depicted by the photography include both erosional and mass wastage forms. The imagery made available to the investigator includes the following: Ektachrome, Ektachrome infrared, panchromatic, and multi-spectral nine-lens photography. The Ektachrome and Ektachrome infrared were available from each of the five missions conducted in the area of study (Missions 14, 23, 34, 53, and 65). The multi-spectral nine-lens was available from two missions (14 and 23), and the panchromatic photography was available from a single mission (14). GRA

N73-15463# East Tennessee State Univ., Johnson City. Remote Sensing Inst.
THE DISTRIBUTION OF SLOPE FAILURE FORMS AS DEPICTED BY REMOTE SENSOR RETURNS
Donald H. Poole 1971 40 p
(Contract N00014-67-A-0102-0001)
(AD-750733; TR-13) Avail: NTIS CSCL 08/6

The objective of the study is to map the distribution of slope failure forms as they are depicted by the remote sensor photography made available to the investigator. No attempt has been made to regionalize their distribution, either quantitatively or qualitatively, except to note the general relationships existing between patterns of distribution and the rocks, soils, and land use practices characteristic of the study area. GRA

N73-15464# East Tennessee State Univ., Johnson City. Remote Sensing Inst.
THE DEVELOPMENT OF CRITERIA FOR RECOGNIZING AND IDENTIFYING SLOPE FAILURE FORMS AS DEPICTED BY REMOTE SENSOR RETURNS
Donald H. Poole 1971 60 p
(Contract N00014-67-A-0102-0001)
(AD-750732; TR-12) Avail: NTIS CSCL 08/6

The study shows that the criteria developed from photographic images depicted by remote sensing photography from NASA's North Carolina Test Site is based largely on pattern, color contrast, and geometric form. Patterns are best reflected in the erosional forms of sheet wash, rill wash, and gullying, and in the mass wastage forms of soil creep and rock fall and rock creep. Color contrast is significant in differentiating all erosional and mass wastage forms of slope failure. The color contrast between an object and its background is frequently the only means of establishing recognition. Geometric form is relied upon most often in recognizing and establishing the identity of the rapid forms of mass wastage, i.e. slump, earth flow, debris slide and rock slide. GRA

N73-15465# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.
USING DETAILED GRAVIMETRY FOR EXPLORATION OF UNDERTHRUST STRUCTURES IN NORTHERN SAKHALIN
A. A. Tereshchenkov and V. E. Kononov Sep. 1972 12 p Transl. into ENGLISH from Neftegazov. Geol. Geofiz. (USSR), no. 2, 1972 p 49-52
(AD-750751; DMAAC-TC-1866) Avail: NTIS CSCL 08/7

At present, a method for exploration of underthrust anticlinal structures for Northern Sakhalin has not been worked out. One of the methods which makes it possible, to a certain degree, to define the structure of underthrust formations is detailed gravimetry. The paper discusses the detailed gravimetry method. Author (GRA)

N73-15466# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.
TRENDS IN SATELLITE GEODESY
L. Stange Oct. 1972 18 p refs Transl. into ENGLISH from Vermessungstechnik (Dresden), v. 19, no. 3, 1971 p 81-85
(AD-750749; DMAAC-TC-1855) Avail: NTIS CSCL 08/5

The paper discusses the probability of further developments of satellite geodesy, based on the results achieved so far. An increase in observation accuracy results in an immediate increase in the accuracy of the derived geodetic elements. It also opens new fields for satellite geodesy and forces a proper refinement of the underlying physico-mathematical models. Author (GRA)

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N73-15467# National Aeronautical Lab., Bangalore (India).
X-RAY DIFFRACTOMETER FOR THE DETERMINATION OF RESIDUAL STRESS
A. K. Singh, C. Balasingh, and N. Narayana Iyer Jun. 1971 26 p refs
(NAL-TN-34) Avail: NTIS HC $3.50

The details of the design and construction are given of an X-ray diffractometer suitable for the determination of residual stresses. The error in the position of the diffraction lines introduced by various factors has been estimated. It is concluded that this simple design offers accuracies sufficient for many problems. Author

N73-15468# Technische Hochschule, Munich (West Germany).
STRONGLY FOCUSING MASS SPECTROMETER Ph.D. Thesis [STARKFOKUSSIERENDES OSZILLOTRON]
Erwin F. Meyer 18 Nov. 1971 29 p refs In GERMAN; ENGLISH summary
Avail: NTIS HC $3.50

A mass spectrometer in which quadrupole fields are used to stabilize ions by virtue of their mass is designed and investigated. These ions are then accumulated in a potential well. The mode of operation of the instrument was demonstrated by plotting stability diagrams. These are in good agreement with numerical calculations. The shape and position of the stability regions was theoretically interpreted. The expected pressure independence of the ion signal could be observed down to 1.6 x 10 to the minus 11 power torr. Author

N73-15469# Research Inst. of National Defence, Stockholm (Sweden).
CAMERA INSTALLATION FOR MULTISPECTRAL PHOTOGRAPHY FROM THE AIR
Svante Larsson and Carl-Hugo Agren Apr. 1971 15 p refs In SWEDISH
(FOA-2-C-2469-52) Avail: NTIS HC $3.00

A technical description of an installation with four electrically driven Hasselblad cameras for synchronously photographing, with different film-filter combinations, from an aircraft of Douglas DC3 type is presented. The construction of the installation and the operation of the cameras are described. An account is included of operating experience and the present uses and treatment of the picture material. Author

N73-15470# Research Inst. of National Defence, Stockholm (Sweden).
TORSION VISCOMETERS
Bertel Laurent Jun. 1971 34 p In SWEDISH
(FOA-1-C-1408-92) Avail: NTIS HC $3.75

A rheological investigation of lubricating media is presented. The torsion viscometer is systematically treated under the assumption that the material being investigated is newtonic. The density of the material is not ignored. The displacement equations are set up and approximations in them are examined for three different special cases. The exact solution for the general case is given in implicit form. Finally the approximations made earlier are examined starting from the exact solution. This gives the possibility of improving the approximations. Author

N73-15471# Research Inst. of National Defence, Stockholm (Sweden).
REPORT ON A VISIT TO THE SYMPOSIUM IN DUBLIN 1970, ON GAS CHROMATOGRAPHY
Bo Jansson and Inger Lindgren Jun. 1971 11 p In SWEDISH
(FOA-1-C-1412-34) Avail: NTIS HC $3.00

Research work reported centers on gas chromatography as well as fluid chromatography. Emphasis is placed on linking of gas chromatographic methods with computer techniques and mass spectrometer methods. Author

N73-15472*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THERMAL CORRECTION OF DEFORMATIONS IN A TELESCOPE MIRROR
Marvin D. Rhodes Washington Jan. 1973 21 p refs
(NASA-TM-X-2673; L-8360) Avail: NTIS HC $3.00 CSCL 14B

Orbiting astronomical observatories have the potential for making observations far superior to those from earth-based mirrors. In order for this performance to be realized, the contour of the primary mirror must be very accurately controlled. A preliminary investigation of the use of thermally induced elastic strains for correcting axisymmetric deformations in space telescope mirrors has been presented. The relation between axial deformation and thermal inputs was determined by a finite difference solution of the equations for thin elastic shells. The use of this technique was demonstrated analytically on a beryllium paraboloid. This mirror had 10 equally spaced thermal inputs and results are presented which show the nature of the temperature distribution required to correct deformations due to an acceleration-type loading. Author

N73-15473*# Iowa Univ., Iowa City. Inst. of Urban and Regional Research.
THE APPLICATION OF REMOTE SENSING TECHNIQUES TO INTER AND INTRA URBAN ANALYSIS Final Report
Frank E. Horton May 1972 253 p refs
(NASA Order W-13165; USGS-14-08-0001-12505)
(NASA-CR-130290; USGS-IR-NASA-250; USGS-DO-73-002)
Avail: NTIS HC $14.75 CSCL 14E

This is an effort to assess the applicability of air and spaceborne photography toward providing data inputs to urban and regional planning, management, and research. Through evaluation of remote sensing inputs to urban change detection systems, analyzing an effort to replicate an existing urban land use data file using remotely sensed data, estimating population and dwelling units from imagery, and by identifying and evaluating a system of urban places utilizing space photography, it was determined that remote sensing can provide data concerning land use, changes in commercial structure, data for transportation planning, housing quality, residential dynamics, and population density. Author

N73-15474*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MEASURING PROBE POSITION RECORDER Patent Application
Bruce Flagge, inventor (to NASA) Filed 12 Jan. 1973 11 p
(NASA-Case-LAR-10806-1; US-Patent-Appl-SN-322998) Avail: NTIS HC $3.00 CSCL 14B

This device enables a person to record the locations of measurements made by a hand-held noncontacting probe. The hand probe is coupled to a linear potentiometer and a sine-cosine potentiometer by means that varies the output of the linear potentiometer proportional to the distance between the hand probe and the linear potentiometer and that varies the output of the sine-cosine potentiometer proportional to the angular movement of the hand probe relative to the sine-cosine potentiometer. The output of the linear potentiometer is applied directly to one input of the sine-cosine potentiometer and is applied through an inverter to the other input or the sine-cosine potentiometer. The person using the hand probe can move the probe along the outline of the model causing a similar outline to be reproduced on the recorder. Structural measurements can then be made on the model and when interesting measurements are made, he can, with the aid of the stylus, mark the points on the recorded outline where these measurements are made. NASA

N73-15475*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN X-RAY MONITOR FOR MEASUREMENT OF A TITANIUM TRITIDE TARGET THICKNESS
Donald L. Alger and Robert Steinberg 1972 14 p refs Presented at Intern. Meeting of the Am. Nucl. Soc., Washington, D. C., 12-16 Nov. 1972
(NASA-TM-X-68170; E-7246) Avail: NTIS HC $3.00 CSCL 14B

An X-ray device capable of measuring titanium tritide film thickness from 0.1 to 30 micrometers has been built and tested. The monitor was designed for use in a rotating target system which used thick targets and incorporated a sputtering electrode to remove depleted layers from the target surface. The thickness measurement can be done in the presence of an intense background of bremsstrahlung and characteristic titanium X-radiation. A measurement can be accomplished in situ in two hours with reasonable accuracy. Author

N73-15476*# Translation Consultants, Ltd., Arlington, Va.
STRUCTURAL DIAGRAM AND PROPERTIES OF A COHERENT ANALYZER
B. I. Goroshkov Washington NASA Jan. 1973 46 p refs Transl. into ENGLISH from "Strukturnaya Skhema i Svoystva Kogerentnogo Analizatora" Moscow, Inst. of Space Res., USSR Acad. of Sci., Rept. Pr-97, 1972 56 p
(Contract NASw-2038)
(NASA-TT-F-14595; PR-97) Avail: NTIS HC $4.50 CSCL 14B

The development of a coherent analyzer is discussed, as are questions associated with the accuracy of determining the amplitude and phase of the frequency components of an input signal. Author

N73-15477*# Ithaco, Inc., Ithaca, N.Y.
A MAGNETIC CONTROL SYSTEM FOR ATTITUDE ACQUISITION
A. Craig Stickler 14 Jan. 1972 43 p refs
(Contract NAS5-21649)
(NASA-CR-130145; Rept-90345) Avail: NTIS HC $4.25 CSCL 14B

A spacecraft magnetic attitude acquisition system is reported that is capable of automatically despinning a satellite from arbitrarily high rates around any axis and provides terminal orientation that makes capture by conventional fine control attitude control systems routine. The system consists of a 3-axis magnetometer, a set of 3 orthogonal magnets, and appropriate control logic. A well-configured system results in despin times of the order of 5 orbits per rpm for spacecraft in low earth orbits. Following despin, terminal orientation is achieved after another one to three orbits, depending on the capture range of the associated fine control system. Author

N73-15478*# Ithaco, Inc., Ithaca, N.Y.
MAGNETIC CONTROL ASSEMBLY REPORTS
A. C. Stickler 25 Apr. 1972 90 p
(Contract NAS5-21867)
(NASA-CR-130143; Rept-90420) Avail: NTIS HC $6.50 CSCL 14B

Results are summarized of the qualification level vibration tests performed on the magnet control assembly (MCA) for Nimbus and ERTS satellites. The MCA electronics and probe units have demonstrated the capability to survive qualification sinusoidal and random vibration levels. The functional testing indicated normal operation of the units after each axis of vibration. Visual inspection indicated no evidence of degradation. Post vibration acceptance testing verified normal operation of the MCA.
Author

N73-15479*# Ithaco, Inc., Ithaca, N.Y.
MAGNETIC CONTROL ASSEMBLY QUALIFICATION MODEL Final Report
Robert C. Shen, Raymond Fleming, Michael Z. Rutkowski, and Robert Z. Fowler 25 Oct. 1972 52 p
(Contract NAS5-21867)
(NASA-CR-130142; Rept-90569) Avail: NTIS HC $4.75 CSCL 14B

Fabrication and testing of the magnetic control assembly (MCA) are summarized. The MCA was designed as an add-on unit for certain existing components of the Nimbus and ERTS attitude control system. The MCA system consists of three orthogonal electromagnets; a magnetometer probe capable of sensing external fields in the X, Y, and Z axes; and the control electronics. An operational description of the system is given along with all major drawings and photographs. Manufacturing and inspection procedures are outlined and a chronological list of events is included with the fabrication summary. D.L.G.

N73-15480*# Scientific Translation Service, Santa Barbara, Calif.
EQUIPMENT FOR MEASURING PRESSURES IN THE APERTURES BETWEEN THE VANES OF COMPRESSOR IMPELLER WHEELS
V. A. Zhebko, Yu. G. Otsechkin, and G. V. Pavlenko Washington NASA Jan. 1973 7 p refs Transl. into ENGLISH from Samoletostr. Tekh. Vozdush. Flota (USSR), no. 25, 1971 p 50-54
(Contract NASw-2483)
(NASA-TT-F-14647) Avail: NTIS HC $3.00 CSCL 14B

A pressure measuring system which, placed in the flow area, will determine the flow structure in compressor impeller bladings during steady and transient modes of operation is described. The block diagram is discussed and total pressure oscillograms are presented. Author

N73-15481*# Perkin-Elmer Corp., Norwalk, Conn. Electro-Optical Div.
RESEARCH STUDY TO DETERMINE CRITICAL OPTICAL/MECHANICAL PROPERTIES OF MATERIALS CONSIDERED FOR SELECTION AS SUBSTRATES FOR THE PRIMARY MIRROR ON A LARGE TELESCOPE Final Technical Report
A. F. Slomba and W. R. Goggin 15 Nov. 1972 50 p
(Contract NAS5-11468)
(NASA-CR-130141; Rept-10784-FTR-2) Avail: NTIS HC $4.50 CSCL 20F

An investigation was conducted to evaluate the stability of a specific low expansion glass-ceramic material relative to its use as a large, lightweight mirror substrate for diffraction-limited spaceborne optical applications. These evaluations were made on a segment (0.44 meter diameter by 0.31 meter thick) of a 2 to 3 meter diameter mirror blank. The dimensional stability of this mirror was measured interferometrically before and after lightweighting, as a function of rough machining, etching, thermal environment, and support configuration. A special computer analysis program was used to plot the coefficients corresponding to aberrations with sixfold symmetry (caused by the mirror's self-weight deflection on a three point support). The objective was to enhance the test sensitivity. Results indicate that any such effects due to self-weight deflection are of the order of 0.015 lambda rms. The rms and peak-to-peak figure changes associated with each processing operation are summarized.

N73-15482*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DIGEST OF NASA EARTH OBSERVATION SENSORS
Robert R. Drummond Dec. 1972 328 p Prepared by IIT Res. Inst.
(NASA-TM-X-66144; X-733-72-464) Avail: NTIS HC $18.50 CSCL 14B

A digest of technical characteristics of remote sensors and supporting technological experiments uniquely developed under NASA Applications Programs for Earth Observation Flight Missions is presented. Included are camera systems, sounders, interferometers, communications and experiments. In the text, these are grouped by types, such as television and photographic cameras, lasers and radars, radiometers, spectrometers, technology experiments, and transponder technology experiments. Coverage of the brief history of development extends from the first successful earth observation sensor aboard Explorer 7 in October, 1959, through the latest funded and flight-approved sensors under development as of October 1, 1972. A standard resume format is employed to normalize and mechanize the information presented. Author

N73-15483# Edgerton, Germeshausen and Grier, Inc., Los Alamos, N.Mex.
RECENT DEVELOPMENTS IN COLOR-FILM THREE-BAND SPECTROSCOPY
S. A. Evans Apr. 1972 26 p refs
(Contract AT(29-1)-1183)
(EGG-1183-5015; EGG-LAD-126) Avail: NTIS

The effective exposure method can be used to study the optical properties of artificial auroras and other high altitude effects that accompany high altitude nuclear bursts. Color film records are particularly useful since they yield both radiance and spectral data when properly unfolded. The main features of the EFFEXP method are explained by using black and white film, and these results are then generalized to include color film.

The problem of determining the dye concentration of each layer of color film is considered, and a technique for doing this is presented. A method for using color film as a low-resolution spectrograph is given. Finally, examples are presented demonstrating the usefulness of color film as a quantitative optical radiation detector. NSA

N73-15484# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Instrumentierung und Antheopotechnik.

LEGIBILITY AND INTERPRETATION INVESTIGATION OF ELECTRONIC DISPLAYS: EFFECTIVENESS OF LUMINANCE AND COLOR CODING OF INDICATING ELEMENTS [LESBARKEITS UND INTERPRETATIONS-UNTERSUCHUNGEN AN ELEUTRONISCHEN DISPLAYS: WIRKSAMKEITSUNTERSUCHUNGEN ZUR LEUCHTDICHTE-UND FARBKODIERUNG VON ANZEIGE-ELEMENTEN]

Ralf Beyer, Hans-Dieter Schenk, and Eckhart Zietlow May 1971 86 p refs In GERMAN; ENGLISH summary
(Contract T-0230-02330-01053)
(DLR-FB-71-57) Avail: NTIS HC $6.50; DFVLR, Porz, West Ger. 18 DM

The effectiveness of luminance and color coding are compared as means for coding display elements to electronic displays. Experimental investigations at the DFVLR are described along with results based on four types of experiments: an immediate-response task, a complex tracking task, the tachistoscopic presentation of information, and an exploration of subjective ratings on different types of color coding in an experimental electronic display. Author (ESRO)

N73-15485# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Munich (West Germany). Inst. fuer Flugtreib- und Schmierstoffe.

SCANNING ELECTRON MICROSCOPY. POSSIBILITIES AND RESULTS WITH THE WINTERSHALL/BAIST FRICTION AND WEAR APPARATUS [DIE RASTER-ELEKTRONENMIKROSKOPIE. MOEGLICHKEITEN UND ERGEBNISSE MIT DEM REIB-VERSCHLEISS-GERAET NACH WINTERSHALL/BAIST]

Eilhard Jantzen Aug. 1971 31 p refs In GERMAN; ENGLISH summary Presented at the Colluq. on Wintershall/Baist Friction and Wear Apparatus, Munich, 25 Mar. 1971
(DLR-FB-71-70) Avail: NTIS HC $3.75; DFVLR, Porz, West Ger. 11,40 DM

A review of application possibilities and principles of scanning electron microscopy is presented, together with first results on oil lubricated sliding surfaces with an oil test apparatus. The test equipment used was a Wintershall/Baist friction and wear apparatus. The apparatus, the essential parameters, and its particular properties are described, and some results are briefly outlined. Improvement of the sliding surfaces by the formation of wear reducing reaction layers, which can be measured by a high electric resistance between the test specimens, could also be made visible with the scanning electron microscope.
Author (ESRO)

N73-15486# Royal Greenwich Observatory, Herstmonceux (England).

THE APPLICATION OF OBJECTIVE GRATINGS TO FAINT STAR PHOTOMETRY

G. A. Harding, R. S. Harbour, and K. P. Tritton 1971 42 p refs
(Roy-Obs-Bull-172) Avail: NTIS

The use of an objective grating on a 74 inch telescope for the extension of magnitude sequences beyond those available photoelectrically is investigated. The existing two-color photometry in Centauri and NGL 6397 is extended and the turn-off point from the main sequence indicated. It is concluded that reasonable results can be obtained with grating provided careful assessment of the errors introduced by the grating is made.
Author (ESRO)

N73-15487# British Steel Corp., London (England). Metallurgy Dept.

TEMPERATURE MEASUREMENT AND CONTROL IN CREEP-RUPTURE TESTING

J. Hacon, A. Higginbottom, J. C. Guest, and D. Burton May 1972 18 p refs Presented at Ger. Creep Conf., Dusseldorf, 3-5 May 1972
(PB-211172; MG/QD/405/72) Avail: NTIS HC $3.00 CSCL 14B

Comparative inter-laboratory creep rupture tests on controlled material have shown that significant variations in results can occur. Such variations can be reduced by paying particular attention to testing technique. For temperature measurement, information is given covering thermocouple history, and particular emphasis is given to the change in calibration during service for both base and noble metal thermocouples. For temperature control, the main emphasis is given to the statistical examination of actual temperature deviations obtained from laboratories and a comparison of these results with the British specifications requirements. Author (GRA)

N73-15488# Dynamics Research Corp., Wilmington, Mass.

OPTICAL ALTITUDE REPORTING SHAFT ANGLE ENCODER Final Technical Report

6 Jun. 1972 28 p
(Contract N00019-70-C-0514)
(AD-749964) Avail: NTIS CSCL 01/4

The report describes the technical approach, engineering data, and test results for three prototype encoders that were built under this program. GRA

N73-15489# TRW Systems Group, Redondo Beach, Calif.

DEVELOPMENT OF A ZERO-G GAUGING SYSTEM Final Report, 1 Nov. 1970 - 9 Jun. 1972

Frank E. Bupp Edwards AFB, Calif. AFRPL Aug. 1972 131 p refs
(Contract F04611-71-C-0010; AF Proj. 3058)
(AD-749967; AFRPL-TR-72-86) Avail: NTIS CSCL 18/4

The ultimate objective of this project is the development of a zero-g gauging system based on the absorption of gamma radiation. The numerous subsystem parameters of a nucleonic gauge were interrelated in closed form and subjected to appropriate tradeoff analyses and optimization routines to synthesize gauging systems capable of meeting the prescribed performance parameters. Particular emphasis was placed on achieving high levels of accuracy (1 percent or better over the entire range of full- to empty-tank conditions) with gauges configured completely external to spherical tanks fueled with cryogenic propellants. Author (GRA)

N73-15490# Army Engineer Topographic Labs., Fort Belvoir, Va.

IMAGE AREA MEASUREMENT USING A SENSOR ARRAY SYSTEM

Pi-Fuay Chen and William W. Seemuller 1972 12 p refs
(AD-750315) Avail: NTIS CSCL 14/2

The paper describes an image area measurement system using a square (two-dimensional) sensor array. The discussion of error analysis and computational results are followed by a description of a hardware system and practical measurement results. Some practical applications of the system are suggested.
Author (GRA)

N73-15491# Air Force Academy, Colo. Dept. of Aeronautics.

A DESCRIPTION OF THE DFAN BIDIRECTIONAL REFLECTOMETER AND BIDIRECTIONAL REFLECTANCE CHARACTERISTICS OF STAINLESS STEEL 304 Technical Report, Jan. 1971 - Jul. 1972

Leo W. Stockham Jul. 1972 27 p refs
(AD-750121; DFAN-TR-72-3) Avail: NTIS CSCL 20/6

The characteristics of the bidirectional reflectometer designed, constructed, and operated in the Department of Aeronautics, USAF Academy are described and discussed. The reflectometer is shown to be an adequate device for studying reflectance of thermal radiation from prepared engineering surfaces. Data obtained from two samples of stainless steel 304 is presented.
Author (GRA)

N73-15492# Westinghouse Electric Corp., Pittsburgh, Pa. Astronuclear Lab.

MATHEMATICAL CALIBRATION OF THE RING TEST WITH

BULGE FORMATION Technical Report, 1 Jan. - 30 Nov. 1971
Vincent DePierre, Fred Gurney, and Alan T. Male Mar. 1972 38 p refs
(Contract F33615-71-C-1163; AF Proj. 7351)
(AD-750885; AFML-TR-72-37) Avail: NTIS CSCL 14/2

An available mathematical solution of ring compression with bulge formation was used to calibrate ring test specimens on the basis of constant interface friction factor, m. Calibration curves for the 6:3:2 (Outside Diameter, Inside Diameter, Thickness) and other ring geometries were obtained by mathematical computation and a method was established for calibrating all ring geometries with bulge formation. Calculated calibration curves of the 6:3:2 ring showed very good correlation with experimentally determined interface friction factors, m. The investigation demonstrated that a valid mathematical solution of ring compression can be used for more accurate and less laborious calibration than experimental calibration of ring test specimens. Author (GRA)

N73-15493# Office of Naval Research, London (England).
INTERNATIONAL CRANFIELD AEROSPACE INSTRUMENTATION SYMPOSIUM, 7TH
Arthur A. Ranger 1 Sep. 1972 15 p Conf. held at Cranfield, England, 20-23 Mar. 1972
(AD-750653; ONRL-C-12-72) Avail: NTIS CSCL 05/2

The report discusses the highlights of a 1972 aerospace symposium devoted to the topic of instrumentation. The complete program is included as an appendix and the information necessary to obtaining a copy of the proceedings is presented. Author (GRA)

N73-15494# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
ELECTROPHOTOMETER FOR RECORDING THE RATIO OF TWO LIGHT CURRENTS
G. M. Malyshev Oct. 1972 9 p refs Transl. into ENGLISH from Pribory i Tekhn. Eksperim. (Moscow), v. 6, 1957 p 98-100
(AD-750595; CRREL-TL-364) Avail: NTIS CSCL 14/2

Described is an experimental model of an electrophotometer recording the ratio of two light currents. The electrophotometer consists of two photomultipliers, a double bridge amplifier and an automatic potentiometer recorder. All basic components of the photometer are described and examples of records are given. Author (GRA)

N73-15495# Ohio State Univ. Research Foundation, Columbus.
THE DESIGN, TEST AND EVALUATION OF A MINIATURIZED ELECTRIC FIELD METER Interim Report
J. E. Evans and H. R. Velkoff Jul. 1972 126 p refs
(Contract DA-31-124-ARO(D)-246; DA Proj. 2O0-15501-B-700)
(AD-750148; TR-13; AROD-4942-18-E) Avail: NTIS CSCL 14/2

The principle of operation of a field mill is explained and analytical analysis of the fixed conductor field mill is presented. Several previous field mill designs are reviewed, and the summary presents the different field mill designs in tabular form. A fixed conductor field mill is designed to operate in a subsonic wind tunnel whose airstream contains a particulate suspension. Various field mill vane configurations are designed, calibrated, and evaluated with the configuration best suited to the environment used to obtain measurement of the magnitude and polarity of the electric field in the wind tunnel. Author (GRA)

N73-15496# Naval Ordnance Lab., White Oak, Md.
TEMPERATURE SENSITIVITY OF SANDWICH TYPE WAVELENGTH SELECTIVE BOLOMETERS
K. Peter Scharnhorst 27 Jul. 1972 27 p
(AD-750264; NOLTR-72-184) Avail: NTIS CSCL 14/2

The transient and steady state response characteristics of a particular kind of bolometer are considered. Radiation is absorbed by a selective absorber in contact with a thermistor film. Thermal relaxation takes place partially by conduction in the plane of the structure. The dependence of the performance characteristics on material and geometrical parameters is determined and performance limits are established for these structures. Author (GRA)

N73-15497# Innsbruck Univ. (Austria). Electronics Lab.
A DIGITAL PHASE MEASURING DEVICE Technical Report, Jan. - Jul. 1972
Dieter Fritz 15 Jul. 1972 21 p refs
(Contract F44620-72-C-0052; AF Proj. 4600)
(AD-750472; SR-1; AFCRL-72-0551) Avail: NTIS CSCL 14/2

With the device described it is possible to measure the mutual phase position of two signals with special consideration of the propagation of VLF and LF waves. The minimum operating input amplitude is selectable. The phase is indicated digitally and is independent on the amplitude and the frequency between 100 Hz and 100 kHz. The device is intended for battery operation (minimum current consumption). The errors resulting from the principle of measurement are calculated and methods are described to restrict them to a minimum. In addition to the block circuit diagram detailed connection diagrams are given. Author (GRA)

N73-15498# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
DEVELOPMENT OF COUNTING STRAIN GAGES FOR HIGH-G NAVAL AIRCRAFT Final Report
David E. Weiss and Sidney Scheindlinger 15 Sep. 1972 26 p
(AD-750692; NADC-72090-VT) Avail: NTIS CSCL 14/2

The NAVAIRDEVCEN has developed and constructed an airborne Strain Level Counter which presents visually the numbers of times that each of four strain levels has been exceeded. The system has two major components: an inductive strain sensor, installed in the critical structural area, which develops a voltage proportional to the strain: an indicator unit which houses all the solid state circuity necessary to energize the sensor and condition its output. The output, after appropriate filtering, is displayed on four electro-mechanical counters. Laboratory and flight tests of the strain sensor alone have been completed and are described. Overall accuracy of the complete system over the temperature range of -55C to -125C is estimated to be within 5%. Author (GRA)

N73-15386* National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
THE SKYLAB RADAR ALTIMETER
H. Ray Stanley and J. T. McGoogan *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 10 p refs (For availability see N73-15369 06-13)
CSCL 14B

N73-15387* Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
GEOS-C RADAR ALTIMETER CHARACTERISTICS
J. Barry Oakes *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 10 p (For availability see N73-15369 06-13)
CSCL 14B

N73-15388* Raytheon Co., Wayland, Mass. Equipment Div.
SATELLITE ALTIMETERS AFTER SKYLAB AND GEOS-C - SHOULD THEY UTILIZE A SINGLE TRANSMITTER OR AN ARRAY OF PULSED AMPLIFIERS?
Alan H. Greene and Edward F. Hudson *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 13 p refs (For availability see N73-15369 06-13)
CSCL 14B

N73-15967 Joint Publications Research Service, Arlington, Va.
PHOTOGRAMMETRY IN CITY PLANNING AND MODERNIZATION
G. Anculete *In its* Transl. on Eastern Europe: Sci. Affairs, No. 290 18 Dec. 1972 p 13-21 refs Transl. into ENGLISH from Terra (Bucharest), no. 5, Sep. - Oct. 1972 p 10-16 (For availability see N73-15965 06-34)

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; reliability; drafting; and materials fabrication, handling, and inspection.

N73-15499 National Lending Library for Science and Technology, Boston Spa (England).
CRACK FORMATION DURING THE STRESS-RELIEF ANNEALING OF WELDED JOINTS
R. Banga, K. Detert, and H. Fischdick [1972] 9 p Transl. into ENGLISH from Chem.-Ing.-Tech. (West Berlin), v. 44, no. 12, Jun. 1972 p 783-787
(NLL-Risley-TR-2507-(9091.9F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The formation of cracks during stress-relief annealing was investigated in the heat-affected zones of weld seams in low-alloy structural steels to determine the influence of embrittlement. It was found that the formation of cracks during stress-relief is dependent on the magnitude of the creep strains required in the heat-affected zone for the reduction of residual stresses. The maximum possible crack lengths are limited by the extent of the heat-affected zone. F.O.S.

N73-15500 National Lending Library for Science and Technology, Boston Spa (England).
HIGH-TEMPERATURE STABILITY OF WELDED JOINTS OF SOME FERRITIC STEELS
E. Jahn [1972] 9 p Transl. into ENGLISH from Chem. Ing. Tech. (Weinheim), v. 44, no. 12, Jun. 1972 p 771-773
(NLL-Risley-TR-2487-(9091.9F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The requirement for constructional compensation to maintain the high temperature stability of welded joints ferritic steels is discussed. The construction of pressure vessels using welding techniques for production control is described. Tests to determine the long time rupture strength of unannealed welds in various steels are reported. Cases of damage resulting from too low a high temperature stability of welds are examined. Author

N73-15501 National Lending Library for Science and Technology, Boston Spa (England).
COMPUTER BASED SYSTEM FOR RELIABILITY PREDICTION: RPP-1
H. Broberg, I. Hansson, L. Joesson, and I. Persson 30 Mar. 1972 36 p refs Transl. into ENGLISH of Defence Telecommunication Lab., Stockholm, report FTL-A-16:11
(NLL-Risley-TR-2329-(9091.9F); FTL-A-16:11) Avail: Natl. Lending Library, Boston Spa, Engl.: 4 NLL photocopy coupons

The program system is intended to make reliability prediction an easily accessible facility for designers, system engineers, and maintenance technicians. At the same time, the structure of the system has been made flexible using easily exchangeable component models. Thus it should be possible to render the results of researches into reliability techniques available quickly, by exchanging the component models in question. The models used only cover electronic and electromechanical components. The greatest contribution provided by the program is probably the provision of relevant reliability information for each individual component in its actual working situation. It is thus also possible to use the program as a library routine on the component level. The program is a system consisting of a great number of subprograms mainly programmed in FORTRAN for IBM 360/75. Author

N73-15502*# Callery Chemical Co., Pa.
DESIGN AND DEVELOPMENT OF DIBORANE SHIPPING CONTAINER Final Report, 7 Nov. 1968 - 18 Sep. 1972
31 Oct. 1972 109 p refs
(Contract NASw-1827)
(NASA-CR-130303; CCC-72-5) Avail: NTIS HC $7.50 CSCL 13D

The design, development, and tests of a 200 pound container for the shipment of liquid diborane are reported. A record of the correspondence with the DOT to obtain a permit for liquid diborane shipment is presented. F.O.S.

N73-15503*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A MANUAL ACTUATOR Patent Application
Raymond L. Gause and C. G. Glenn, inventors (to NASA) Filed 27 Jun. 1972 18 p
(NASA-Case-MFS-21481-1; US-Patent-Appl-SN-266771) Avail: NTIS HC $3.00 CSCL 13I

An input actuator device for exercising machines used onboard spacecraft is described. The actuator is selectively configured for use selectively by either hand or foot. NASA

N73-15504# Pisa Univ. (Italy).
RESPONSE OF A TRIPHASE INDUCTION MACHINE TO PERTURBATIONS DUE TO TEMPORARY INTERRUPTIONS IN THE FEEDER NETWORK [RIPOSTA DELLA MACHINA TRIFASE A INDUZIONE ALLE PERTURBAZIONI DI INTERRUZIONE TEMPORANEA DALLA RETE DI ALIMENTAZIONE]
F. Nencioni and R. Pieri Sep. 1970 13 p refs In ITALIAN
(Publ-1360) Avail: NTIS HC $3.00

The electromagnetic behavior is examined of a triphase induction motor when subjected to brief periods of power interruptions. The laws which govern the response of an induction motor to gradual perturbations are presented along with the response to sharp phase changes in the feeder system. The practical application of the expressions for evaluating transient overcurrents, and the parametric evaluation of the characteristics of the motor are illustrated. Transl. by F.O.S.

N73-15505# Cranfield Inst. of Technology (England).
PRELIMINARY INVESTIGATION INTO A MACHINE TOOL SPINDLE DRIVE SYSTEM
J. T. Hayden and I. A. Alston Jun. 1972 30 p refs
(E/C-3) Avail: NTIS HC $3.50

Recent developments in machining techniques have created a need for a high-performance, 10 h.p. machine tool spindle drive. This drive was carefully specified and a search was made of available drives to meet this specification. The normal direct current type of motor drive was found to be unsuitable and an alternating current drive involving a dc link frequency changer and a synchronous motor was investigated. Author

N73-15506# Research Inst. of National Defence, Stockholm (Sweden).
ATTENDANCE AT A COURSE ON "STRUCTURAL SANDWICH DESIGN AND FABRICATION" AT THE UNIVERSITY OF CALIFORNIA JUNE 1969, AND STUDY VISITS CONNECTED WITH IT
Fritz Larsson Jun. 1971 22 p refs In SWEDISH
(FOA-4-C-4467-61) Avail: NTIS HC $3.25

An account is given of a University of California course concerned with dimensioning, constructing, and manufacturing structural sandwich elements, together with impressions from visits to industries manufacturing material for sandwich elements, mainly nonmetallic. Author

N73-15507*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELASTOHYDRODYNAMIC ANALYSIS USING A POWER LAW PRESSURE-VISCOSITY RELATION
Stuart H. Loewenthal and Erwin V. Zaretsky Washington Jan. 1973 29 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Cleveland
(NASA-TN-D-7121; E-6973) Avail: NTIS HC $3.00 CSCL 20D

An isothermal elastohydrodynamic (EHD) inlet analysis of the Grubin type which considers a power law pressure-viscosity relation and a finite pressure at the inlet edge of the Hertzian contact zone was performed. Comparisons made with published X-ray EHD film thickness data for a synthetic paraffinic oil and when conventional EHD theory showed that the present theory exhibits a slightly stronger film thickness load dependence than do previous isothermal EHD theories but far less than that exhibited by the measured data. Author

N73-15508*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TEXTURING IN METALS AS A RESULT OF SLIDING
Donald R. Wheeler and Donald H. Buckley Washington Jan. 1973 15 p refs
(NASA-TN-D-7136; E-7160) Avail: NTIS HC $3.00 CSCL 11F

Sliding friction experiments were conducted with copper, nickel, iron, and cobalt sliding on themselves in air and argon. The resulting wear surfaces were examined with X-ray analysis to determine if surface texturing had occurred as a result of sliding. Results of the investigation indicate that, for the face-centered-cubic metals copper and nickel, a (111) texture develops with the (111) planes tilted 10 deg in the direction of sliding. The body-centered-cubic metal iron exhibited a (110) texture with the (100) direction oriented in the direction of sliding. It also exhibited a 10 deg tilt in the direction of sliding. The environment influenced the results in that the degree of texture observed in argon was less than that seen in air for iron. No texturing was observed for the close-packed-hexagonal metal cobalt. Recrystallization was observed with copper as a result of sliding. Author

N73-15509*# Bell Aerospace Co., Buffalo, N.Y.
NONDESTRUCTIVE TESTS OF REGENERATIVE CHAMBERS, APPENDIX Final Report
G. A. Malone, R. Stauffis, and R. Wood Jul. 1972 93 p
(Contract NAS3-14376)
(NASA-CR-120980-App; BAC-8654-953003-App) Avail: NTIS HC $6.75 CSCL 14D

Results are presented of nondestructive tests conducted on electroformed, brazed, and diffusion welds in regenerative chambers. A.L.

N73-15510# WADCO Corp., Richland, Wash.
FATIGUE-CRACK GROWTH IN TYPE 304 STAINLESS STEEL WELDMENTS AT ELEVATED TEMPERATURE
Lee A. James 3 Dec. 1971 22 p refs Presented at Symp. on Fatigue at Elevated Temp., Storrs, Conn., 18 Jun. 1972
(Contract AT(45-1)-2170)
(HEDL-SA-329; Conf-720622-1) Avail: NTIS

The propagation of fatigue cracks in gas-tungsten-arc weldments of Type 304 stainless steel was studied at 75 F (24 C) and 1000 F (538 C). It was found that the crack growth rate for cracks propagating normal to the direction of welding decreased as the crack approached the weld, and then increased as the crack grew through the weld and out the other side. It is postulated that this is due to the residual stresses produced during the welding process, and that metallurgical variations in the weldment play a minor role. Author (NSA)

N73-15511# Kentucky Univ., Lexington.
PROJECT THEMIS. METAL DEFORMATION PROCESSING Annual Report, 1 Sep. 1970 - 31 Aug. 1971
Hans Conrad and Mehmet Doner Jul. 1972 222 p refs
(Contract F33615-69-C-1027; AF Proj. 7912)
(AD-750556; AFML-TR-72-12; AR-3) Avail: NTIS CSCL 13/8

Uniaxial tensile tests on titanium indicated that (a) twinning is important in the low temperature deformation kinetics of Ti-50A; (b) the deformation kinetics of Ti-6Al-4V at low temperatures are governed principally by the interstitial solute content. Both single and double maximum type flow patterns were observed for the extrusion of Ti-5Al-2.5Sn. The temperature and stress fields existing during the hot extrusion of Ti-6Al-4V were calculated. Author (GRA)

N73-15512# Rensselaer Polytechnic Inst., Troy, N.Y.
PROCEEDINGS OF THE 17TH MEETING OF THE MECHANICAL FAILURES PREVENTION GROUP
W. T. Sawyer 1 Nov. 1972 93 p refs Conf. held at Boulder, Colo., 25-27 Apr. 1972
(Contract N00014-67-A-0117-0015; NR Proj. 259-095)
(AD-750411; MFPG-10) Avail: NTIS CSCL 11/6

Presented is a report of three-day discussions by a group of nationally-recognized specialists on the subject "Environmental Effects on Mechanical Failures, Mechanisms and Detection". Summaries are presented of fifteen prepared talks which had as their objectives the examination of the state of the art on various aspects of environmental effects on mechanical failures, the mechanisms involved, and the methods of detection. Limitations and gaps on the technology available for problem solving are identified, providing guidance for future research. Reports of problems encountered in current field service provide an estimate of the magnitude of the problem and the relevance of current research. Significant audience discussions are reported. Author (GRA)

N73-15513# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EFFECT OF HIGH PRESSURE SHOCK WAVES ON THE STRUCTURE AND PROPERTIES OF BIMETALS PRODUCED BY DIFFERENT CLADDING METHODS
Z. M. Gelunova, M. G. Lozinskii, P. O. Pashkov, A. I. Tananov, and V. K. Shashkova 16 Aug. 1972 25 p refs Transl. into ENGLISH from Fiz. Khim. Obrabotki materialov (USSR), no. 3, 1970 p 110-120
(AD-750958; FTD-HT-23-525-72) Avail: NTIS CSCL 13/8

The possibility was established of strengthening the clad metals steel 3 + Kh18N10T and 30KhGSA + Kh18N10T by shock waves. These clad metals are characterized by chemical structural, and mechanical inhomogeneities in the contact zone between the base and cladding materials. The action of shock waves of a large enough amplitude results in a more homogeneous plastic deformation and a lower propensity towards local embrittlement. Treatment of the 2 layer steels by shock waves of 200-300 kilobars with subsequent heat treatment at 600-800 degrees increases the strength, plasticity and reliability of clad materials. Author (GRA)

N73-15514# National Materials Advisory Board, Washington, D.C.
YIELD OF ELECTRONIC MATERIALS AND DEVICES Final Report
Jul. 1972 102 p refs
(Contract DA-49-083-OSA-3131)
(AD-749984; NMAB-290) Avail: NTIS CSCL 09/1

A study has been made of problems associated with production yield of electronic materials and associated devices. The fraction of starting material resulting in useful end-items is considered as the effective yield from the government's point of view. Reliability considerations are of necessity given important weight in the deliberations of the Committee. The report discusses practical problems of fabrication process and techniques, problems arising from current practice in specifications and standards, and problems arising from system applications and use. An unusual real-life case history of a major reliability study closes the report. Author (GRA)

N73-15515# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
A STUDY OF THE PRACTICABILITY OF ACTIVE VIBRATION ISOLATION APPLIED TO AIRCRAFT DURING THE TAXI CONDITION
Charles D. Corsetti and James D. Dillon Jul. 1972 171 p refs
(AF Proj. 8129)
(AD-750137; AFFDL-TR-71-159) Avail: NTIS CSCL 13/9

The feasibility of using an active control in the landing gear system of an aircraft to reduce wing fatigue damage resulting from ground induced vibrations during taxiing is considered. The characteristics of three vehicle models are discussed: a single landing gear system, a tricycle landing gear system and a system of five landing gears. Mathematical expressions for the runway inputs to each vehicle model are obtained in the form of random inputs represented by Gauss-Markov processes. The model for a linear hydraulic actuator which is used as the active control element in the landing gear system is presented. Author (GRA)

N73-15516# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PLASTIC DEFORMATION OF REFRACTORY METALS IN A VACUUM
Ya. B. Gurevich and V. L. Orzhekhovskii 8 Sep. 1972 24 p refs Transl. into ENGLISH from Probl. Metalloved. i Fiz. Met., Inst. Metalloved. i Fiz. Metal., Sb. Tr. (Moscow), no. 58, 1968

p 198-211
(AD-750508; FTD-HT-23-583-72) Avail: NTIS CSCL 13/8

The high temperature plastic deformation of refractory metals in vacuum (0.0001-0.00001 torr) differ from deformation in air in (1) an absence of scale on the surface of the billets (very fine somewhat oxidized layer is formed only on Ti and Nb), (2) an increase for Nb, Mo, and evidently W, and a decrease for Ti of the friction coefficient during rolling, and (3) an increase in the deformation resistance for Mo and W and a decrease tor Ti and Nb during rolling. Author (GRA)

N73-15517# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

EFFECTS OF ROLLING CONDITIONS ON THE STRENGTH OF THE BOND BETWEEN NIOBIUM AND COPPER

A. A. Aleksandrov, N. D. Rybalchenko, and A. S. Tron 16 Aug. 1972 13 p Transl. into ENGLISH from Tr. Politekh. Inst. (USSR), no. 38, 1969 p 107-110
(AF Proj. 7351)
(AD-750511; FTD-HT-23-1058-72) Avail: NTIS CSCL 13/8

A series of experiments with bonding niobium to copper or a copper alloy by pack rolling in vacuum was performed in order to establish the optimum temperature and reduction, which would ensure a strong bond between both metals. The niobium copper composites are of interest as structural materials which should have a much higher heat resistance than that of copper and a lower susceptibility to local overheating than that of niobium; and as insert materials for welding titanium to steel since niobium is easily welded to titanium and copper can be easily joined to steel. Author (GRA)

N73-15518# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ASSORTMENT OF SOLID LUBRICATION COATINGS USING A MOLYBDENUM DISULFIDE BASE AND THE FIELD OF THEIR APPLICATION

L. Sentyurikhina, E. Oparina, Z. Rubtsova, and V. Listov 1 Sep. 1972 19 p refs Transl. into ENGLISH from Tr. Vses. Nauch.-Issled. Inst. Neftepererab. Prom. (Moscow), no. 11, 1969 p 252-262
(AF Proj. 7343)
(AD-750998; FTD-HC-23-866-72) Avail: NTIS CSCL 11/8

The properties of 5 solid lubricating coatings based on molybdenum disulfide were determined on friction testing machines. These lubricants were tested by using gear wheels, gear type couplings, gear racks, screws and nuts, click devices, ball joints, pivot bearings, and rope drums. GRA

N73-15519# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

A VARIATIONAL METHOD FOR SOLVING THE ISOTHERMAL PROBLEM OF THE HYDRODYNAMIC THEORY OF LUBRICATION FOR A THRUST BEARING HAVING AN UNDEFORMED PAD

P. Z. Popov 7 Sep. 1972 20 p refs Transl. into ENGLISH from Tr. Leningr. Korablestroitelnyi Inst. (Leningrad), no. 67, 1969 p 149-159
(AD-750485; FTD-HC-23-878-72) Avail: NTIS CSCL 11/8

The article deals with the problem of the hydrodynamic theory of lubrication of the pad of a thrust bearing with a rectangular supporting surface. Integration of the Reynolds equation was performed in an approximate manner by the Kantorovich variational method. The solution of the problem was determined in the second approximation. Characteristic curves were constructed for the parameters which determine the carrying capacity, the force of friction, the point of approach of the resultant forces of pressure, the consumption and temperature rise of the lubricant. An example of calculation of the thrust bearing is given. GRA

N73-15520# Mechanical Technology, Inc., Latham, N.Y.

RESEARCH ON ELASTOHYDRODYNAMIC LUBRICATION OF HIGH SPEED ROLLING-SLIDING CONTACTS Final Report, 1 Feb. 1971 - 1 Feb. 1972

Richard L. Smith, Jed A. Walowitt, Pradeep K. Gupta, and John M. McGrew Jul. 1972 156 p refs
(Contract F33615-69-C-1305; AF Proj. 3048)
(AD-750752; MTI-71TR41; AFAPL-TR-72-56) Avail: NTIS CSCL 11/8

A rolling disc apparatus was used to obtain traction measurements for a MIL-L-7808 oil. A full matrix of data covering a range of loads, speeds, and temperatures is presented along with analytical correlation which reasonably describes the data over these parameters. Attempts were made to measure film thickness with optical, capacitance, and X-ray measuring techniques. The partial elastohydrodynamic regime was studied analytically and experimentally. Electrical continuity and resistance data have been obtained and comparisons between measured electrical resistance and predictions obtained with the asperity interactions analysis put forth in Task 2 were obtained. Author (GRA)

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid-State.

N73-15521# Communications Research Centre, Ottawa (Ontario).

EXPERIMENTAL AND THEORETICAL CONSIDERATIONS OF DISTRIBUTED FEEDBACK SIDE COUPLED LASERS

K. O. Hill and A. Watanabe Oct. 1972 16 p refs
(CRC-1235) Avail: NTIS HC $3.00

The possible operating modes of a distributed-feedback side coupled laser are discussed. A modal analysis of thin film distributed feedback lasers is presented and used to elucidate the mode of operation of the side coupled laser. Experimental observations made to determine the nature of the laser output are shown to support the hypothesis that laser action is preferentially obtained in modes belonging to a high order bound mode group of the structure. Author

N73-15522# Defence Research Establishment Valcartier (Quebec).

THE INITIAL DISTRIBUTION OF CO(PLUS) FROM THE REACTION O PLUS CS YIELDS CO(PLUS) PLUS S

K. D. Foster Oct. 1972 17 p refs
(DREV-TN-2019/72) Avail: NTIS HC $3.00

The CS2/O2 continuous wave chemical laser was studied in a transverse flow system. From a determination of the rotational temperature and the upper state J value for which maximum gain occurred in several CO vibrational bands, an estimate of part of the vibrational distribution of CO(+) from the reaction O + CS yields CO(+) + S was obtained. This distribution indicated that the most probable level of formation of newly born CO(+) is v = 12 plus or minus 1, which represents approximately 90% of the energy liberated from the reaction. Author

N73-15523# Defence Research Establishment Valcartier (Quebec). Defence Research Board.

A STUDY OF THE THERMALLY INDUCED NONLINEAR PROPAGATION OF A LASER BEAM IN AN ABSORBING FLUID MEDIUM

L. R. Bissonnette Nov. 1972 32 p refs
(DREV-TN-2049/72) Avail: NTIS HC $3.75

A mathematical model of the thermally induced nonlinear propagation of a laser beam in an absorbing fluid medium is developed. The theory includes, identifies, and clearly assesses the relative importance of the different regimes due to conduction, free convection, and/or forced convection cooling. The derived equations of propagation explicitly account for the diffraction effects and permit a straightforward estimate of their relative influence with respect to the thermal distortion. More specifically, similarity parameters of scaling laws are deduced from the governing equations. There is a total of five of these parameters, but it frequently happens in practical applications that the actual number is reduced to only one. Sample numerical results are presented to illustrate some of the implications connected with the proposed model. Author

N73-15524# Joint Publications Research Service, Arlington, Va.

COMBINED GAS-LASER PUMPING

Ye. P. Velikhov, I. N. Novobrantsev, V. D. Pismennyy, A. T.

Rakhimov, and A. N. Starostin 2 Jan. 1973 8 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 205, no. 6, 1972 p 1328-1331
(JPRS-57880) Avail: NTIS HC $3.00

An examination of filamentary fluctuation of the gas density parallel to an electric field which is assumed to be constant is presented. It notes that overheating ionization instability can develop in the initial stage of heavycurrent pulsed discharges of the pinch type. Author

N73-15525*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DETERMINATION OF THE TEMPERATURE OF GAS MIXTURES BY USING LASER RAMAN SCATTERING
Thom A. Coney and Jack A. Salzman Washington Jan. 1973 36 p refs
(NASA-TN-D-7126; E-7045) Avail: NTIS HC $3.00 CSCL 20E

A theoretical model for the Raman rotational spectrum of air was formulated, yielding the spectral temperature dependence; and an error analysis of temperature measurement accuracies was performed. The theoretical spectra and the predicted temperature measurement error of + or - 20 K (7 percent) compared well with experimental data. These experimental data consisted of Raman spectra of air obtained for temperatures ranging from 243 to 313 K at a pressure of 1 atmosphere. The use of selected lines resulted in an experimental accuracy of + or - 13 K (-5 percent). Author

N73-15526# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
EUROMECH 36: LASER ANEMOMETRY REPORT
F. Durst, A. Melling, and J. H. Whitelaw May 1972 33 p refs
(ET/TN/A/20) Avail: NTIS HC $3.75

A study of laser anemometry use in physics, electronics, and fluid mechanics is presented. Data cover general operating principles, development of an optical and signal processing system, and the state of laser anemometry in Europe. Particular attention was given to turbulence research with the laser. E.H.W.

N73-15527# Defence Research Establishment Valcartier (Quebec).
CHARACTERISTICS OF A CS2/O2 CHEMICAL LASER WITH FLOW TRANSVERSE TO THE OPTICAL AXIS
K. D. Foster and G. H. Kimbell Nov. 1972 21 p refs
(Proj. 95-10-68)
(DREV-R-684/72) Avail: NTIS HC $3.25

A continuous wave chemical laser which had its optical axis transverse to the direction of gas flow was constructed. Measurements were made of the laser output spectra and power as the distance was varied from the point of mixing of the reagents CS2 and O/O2/He. An output power level of one watt in a 15 centimeter length was easily obtainable with improvement resulting from beam folding. The spectroscopic data enabled measurements of the initial vibrational distribution of the chemical pumping step O + CS yields CO(+) + S to be made in addition to the decay of the vibrational population inversion as the reacting gases were swept forward into the laser cavity. Author

N73-15528# Addis Translations International, Woodside, Calif.
PICOSECOND NEODYMIUM-GLASS LASER IN THE TERAWATT RANGE
H. Salzmann Jul. 1972 59 p refs Transl. into ENGLISH of "Ein Pikosekunden-Neodymglas-Laser im Terawattbereich," Max-Planck-Inst. fuer Plasmaphys., Garching, West Germany, Oct. 1971 35 p Prepared for Calif. Univ., Livermore. Lawrence Livermore Lab. Sponsored by AEC
(UCRL-Trans-10633; IPP-IV/21) Avail: NTIS

The phase-coupled neodymium laser described emits laser pulses with energies of up to several joules, the pulse duration being about 10 ps. The angular divergence of the radiation is 700 microrad, i.e., with an f = 15 cm lens a focal-spot area of some 0.0001 cm2 can be attained. Under these conditions the intensity in the focal spot may go as high as 3 x 10 to the 15th power W/cm2. The laser consists of an oscillator, an electro-optical switch, a preamplifier chain and a main amplifier chain. A single pulse is separated from the chain of ultrashort laser pulses with the fast electro-optical switch. In the process, the intensity of the remaining pulses is reduced to 1/3000 of that of the transmitted pulse. The separated single pulse first passes twice through an initial preamplifier chain and is then mirrored into the main amplifier chain, which contains two optical insulators to attenuate the light reflected from the target in order to prevent damage to the laser. Author (NSA)

N73-15529# Kanner (Leo) Associates, Redwood City, Calif.
PULSED GAS DISCHARGE LASERS
G. G. Petrash [1972] 69 p refs Transl. into ENGLISH from Usp. Fiz. Nauk. (USSR), v. 105, no. 4, Dec. 1971 p 645-676 Sponsored by AEC Prepared for Sandia Labs.
(SC-T-722524) Avail: NTIS

A brief description is given of the properties and physical mechanisms of pulsed gas discharge lasers. Special attention was given to laser efficiency, high power requirements, and operating properties at high temperatures. E.H.W.

N73-15530# Texas Univ., Dallas.
INVESTIGATION OF THE FEASIBILITY OF THE ELECTRON BEAM-EXCITED, HIGH PRESSURE RECOMBINATION LASER Semiannual Technical Report, 21 Mar. - 21 Oct. 1972
Carl B. Collins 21 Oct. 1972 85 p refs
(Contract N00014-67-A-0310-0007; ARPA Order 1807)
(AD-750777; UTDP-A002-1; SATR-1) Avail: NTIS CSCL 20/5

The report describes research applied toward the determination of the feasibility of developing a recombining, electron beam-excited plasma into a pulsed laser of exceptionally high peak power. Author (GRA)

N73-15531# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
LASER INDUCED DAMAGE IN INHOMOGENEOUS OPTICAL COATINGS M.S. Thesis
J. M. Putman Jun. 1972 97 p refs
(AD-749852; GEP/PH/72-16) Avail: NTIS CSCL 11/3

The structural effects of various optical coatings on their single shot laser induced damage threshold is discussed. Films were subjected to irradiation by a pulsed neodymium glass laser. In an attempt to isolate the influence of film stress on damage threshold, various stress films were constructed by mixing two component materials of similar damage thresholds but opposite stress characteristics. Results showed that stress-relieved films had higher damage thresholds. Additional vapor phase mixture films were prepared from component materials of widely different damage thresholds, changing the mixing ratio for each film. Damage results showed that thresholds for mixtures lie between the thresholds for each component, being somewhat dependent on the amount of each component present in the film. Discrete films showed a damage dependence on the angle of incidence of deposition. Results confirm that damage thresholds are very much material and residual stress dependent. Author (GRA)

N73-15532# Army Missile Command, Redstone Arsenal, Ala.
THEORETICAL STUDIES OF HIGH ENERGY PULSED CO2 LASERS
Charles Cason and Steven J. Kast 1972 17 p refs
(AD-750314) Avail: NTIS CSCL 20/5

Pulsed CO2 lasers are receiving considerable attention at the US Army Missile Command because of their advantages over cw lasers. Theoretical studies of laser kinetic processes, together with a new pressure scaling method developed in-house, have led to the development of a useful mathematical model for electron-beam-controlled CO2 lasers which shows close agreement with experimental observations. The model has indicated that energies approaching 80 joules/liter-atm are possible. The current goal of a 10-kJ/pulse laser is realizable in a 200 liter-atm laser structure. GRA

N73-15533# Army Electronics Command, Fort Monmouth, N.J.
A THREE FREQUENCY HETERODYNE DETECTION LASER COMMUNICATIONS SYSTEM FOR ARMY TACTICAL APPLICATIONS

Larry U. Dworkin and Jack E. Zavin 1972 16 p refs
(AD-750321) Avail: NTIS CSCL 17/2

The carbon dioxide laser represents an excellent transmitter for long range wide bandwidth tactical laser communications systems because of its high efficiency, air-cooled, long lifetime stable operation. In addition, it is well within the state-of-the-art of modulators and detectors to fabricate semi-tactical carbon dioxide laser communications system using conventional techniques. The use of the two frequency approach has been shown to be identical to direct detection but possesses the advantages of the heterodyne configuration and thus offers an interesting alternative to present systems for short paths. The current investigation indicates that the three frequency approach presents an attractive trade-off by allowing a small loss in signal-to-noise margin for a large gain in system simplification. GRA

N73-15534# Army Missile Command, Redstone Arsenal, Ala.
LASER ASSISTED LOW ENERGY X-RAY FLASH GENERATION
Romas A. Shatas, Thomas G. Roberts, Harry C. Meyer, and John D. Stettler 1972 18 p refs
(AD-750375) Avail: NTIS CSCL 20/9

In the paper, the authors analyze alternate methods for the soft X-ray pulse generation which rely on the unprecedented values of light flux attainable with high pulse energy lasers. For this purpose, in section 2 the authors outline some aspects of laser-plasma interaction pertinent to attainment of thermonuclear reaction temperatures. The authors note that presently considered techniques for X-ray generation from laser plasmas are based on inertial plasma confinement. GRA

N73-15535# Army Natick Labs., Mass.
SPECTROSCOPIC STUDIES OF LUMINESCENCE EMITTED BY DYES IRRADIATED BY LASER LIGHT
John A. Sousa and Joseph F. Roach 1972 11 p refs
(AD-750377) Avail: NTIS CSCL 17/5

To reduce the detectability of the soldier under field conditions using currently available visual and electro-optical methods, several dyes have been integrated into military equipment to blend in with the background. The authors have established that this method of approach would likely be inefficacious against multiple wavelength laser emission since materials, on the absorption of laser light, would luminesce and emit light at a wavelength differing from the laser. They have pursued luminescence studies of dyed systems and found an effective method for using this characteristic of light emission to defeat the purpose for which coloring schemes are intended. GRA

N73-15536# Army Electronics Technology and Devices Lab., Fort Monmouth, N.J.
LIGHTWEIGHT, SMALL LASER TRANSMITTER DESIGN FOR RANGEFINDERS
John Hynd, John W. Strozyk, and Jesse Moss, Jr. 1972 15 p refs
(AD-750383) Avail: NTIS CSCL 17/5

The feasibility of building a small, lightweight switch laser oscillator to meet certain physical, electrical and laser specifications was demonstrated. Author (GRA)

N73-15537# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
MEASUREMENTS OF LASER EXTINCTION IN ICE FOG FOR DESIGN OF SEV PILOTAGE SYSTEM
Richard Munis and Allan Delaney Aug. 1972 23 p refs
(ARPA Order 1615)
(AD-750114; CRREL-RR-302) Avail: NTIS CSCL 17/7

Laser extinction measurements in ice fog were made at wavelengths of 0.6328, 1.15 and 3.39 microns. The ice fog was generated in an environmental chamber whose temperature could be lowered to -43C. Particle sampling was carried out simultaneously with the laser measurements using an impactor. Size distributions were derived from the impactor measurements. These data were used to compute Mie extinction coefficients at the three laser wavelengths. These coefficients were compared with the coefficients derived experimentally. Although some discrepancy exists between theory and experiment, both agree fairly well on the behavior of the extinction coefficient as a function of particle concentration. Author (GRA)

N73-15538# Queens Univ., Belfast (Northern Ireland). Dept. of Pure and Applied Physics.
LASER PICOSECOND PULSE GENERATION AND MEASUREMENT Final Scientific Report, 1 Sep. 1969 - 29 Feb. 1972
D. J. Bradley 29 Feb. 1972 210 p refs
(Contract F61052-70-C-0003; AF Proj. 4645)
(AD-750789; AFCRL-72-0364) Avail: NTIS CSCL 20/5

Detailed studies of ruby laser mode-locking with saturable absorbers were carried out. Oscillation in pure, low order transverse modes has been achieved and improvements in pulse duration and general reproducibility have been obtained by employing DDCI in optical contact with a laser cavity mirror. Anomalous quenching effects of two-photon fluorescence patterns in Rhodamine 6G and DPA have been extensively studied. Transverse mode-locking of the ruby laser has also been observed in a confocal cavity which also produced simultaneous transverse and longitudinal mode-locking. The saturable action of phthalocyanine dyes in the vapour phase has been studied and successful Q-switching of the ruby laser employing phthalocyanine vapour has been accomplished. Author (GRA)

N73-15539# Naval Training Equipment Center, Orlando, Fla.
THREE HUNDRED AND SIXTY DEGREE HOLOGRAPHY
Windell N. Mohon, Alfred H. Rodemann, and Denis R. Breglia Aug. 1972 17 p refs
(AD-750250; NAVTRAEQUIPCEN-TN-25) Avail: NTIS CSCL 14/5

The use of a hologram as a static three dimensional visual display is somewhat restricted by the limited viewing angle. This viewing angle is a function of the geometric relations between the size of the object to be recorded, the distance from the object to the recording medium, and the size and shape of the recording medium. A typical hologram is made on a flat photographic plate with the viewing angle consequently limited by the edges of the plate. One technique for extending the viewing angle to three hundred and sixty degrees (in one plane) is to use a flexible recording medium which extends around the object when properly illuminated. The resulting hologram yields a three hundred and sixty degree viewing angle of the three dimensional holographic image. Specific steps in the experimental development are described. Procedural problems, such as vibration and intensity non-uniformities, are discussed. Methods and equipments which lead to satisfactory holograms are outlined. A simple method for reconstruction and viewing is described. Pictures of resultant holograms are given. Consideration is given to extension of the technique to three hundred and sixty degrees in both horizontal and vertical planes. Author (GRA)

N73-15540# Columbia Univ., New York.
LASER PHYSICS Final Report, 1 Jul. 1964 - 30 Jun. 1972
Sven R. Hartmann Sep. 1972 7 p ref
(Contract DA-31-124-ARO(D)-341; DA Proj. 200-61102-B-11B)
(AD-750155; AROD-5566-21-P) Avail: NTIS CSCL 07/4

Presented is the final report on a study of photon-echo generation and photon-echo behavior. Also mentioned is research on superradiance. A brief summary of the results, a listing of publications, scientific personnel and degrees awarded are provided. GRA

N73-15541# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
TUNABLE GAS LASERS UTILIZING GROUND STATE DISSOCIATION
A. V. Phelps 15 Sep. 1972 35 p refs
(Contract DAHC04-72-C-0047)
(AD-750156; JILA-110) Avail: NTIS CSCL 20/5

Experimental and theoretical studies of the spectral distribution of fluorescence and absorption in the far wings of alkali resonance lines broadened by rare gas atoms will be used as a basis for the prediction of approximate values for the laser gain in such mixtures and in Xe2, i.e., ground state dissociation lasers. This discussion makes use of the quasistatic theory of spectral line broadening which relates the observed fluorescence intensity to the intermolecular potentials for the bound excited state and the dissociating ground state of the molecule. Author (GRA)

N73-15542# Northrop Corp., Hawthorne, Calif. Laser Systems Dept.
CARBON MONOXIDE SPECTRAL LINE SELECTION STUDIES
D. K. Rice Aug. 1972 113 p refs
(Contract N00014-72-C-0043; NR Proj. 016-303)
(AD-749823; NLSD-72-13R) Avail: NTIS CSCL 20/5

An intracavity vapor cell in conjunction with a CO laser was used to experimentally measure the absorptive losses introduced by water vapor and CO2 for 20 of the laser emission lines in the 7-6 to 10-9 vibrational bands. The results indicate that the existing theoretical models are inadequate for predicting actual absorptance values for water vapor partial pressures in excess of 100 torr. The pressure broadening by N2 and CO2 was shown to increase the differential absorptive loss introduced by the water vapor for CO laser rotational lines. However, the self-broadening effect and increased effective absorber thickness introduced by the addition of more water vapor was seen to be more effective. Author (GRA)

N73-15543# International Business Machines Corp., Yorktown Heights, N.Y. Watson Research Center.
STUDY OF OPTICAL MASERS Final Report, 1 Apr. 1964 - 13 Apr. 1972
G. Burns and P. P. Sorokin Oct. 1972 13 p refs
(Contract DA-31-124-ARO(D)-205; DA Proj. 200-61102-B-11B)
(AD-750711; AROD-3318-89-P) Avail: NTIS CSCL 20/5

The contract covers a broad program of laser research. It includes studies of the laser itself, novel lasers, novel components of laser systems, studies of the quantum noise of lasers, spectroscopy of laser systems, basic properties of crystals that can be used in conjunction with lasers. Author (GRA)

N73-15544# New Mexico State Univ., University Park.
STUDY OF BASIC PHYSICAL MECHANISMS OF TUNABLE INFRARED LASERS (LASER EXCITED EMISSION FROM SELECTED ORGANIC LIQUIDS) Final Report, 1 Jan. 1970 - 31 Dec. 1971
Jerald R. Izatt Mar. 1972 76 p refs
(Contract F19628-70-C-0154; AF Proj. 8603; AF Proj. 4645)
(AD-750480; AFCRL-72-0169) Avail: NTIS CSCL 07/4

The 8-15 micron emission spectra of several liquid cyclopentane derivatives have been measured. The samples, all of which have strong absorption bands near 10.6 microns, were excited with a CW CO2 laser operating at a power level of a few watts. Phase-sensitive detection was employed, and both spectral and temporal discrimination were used to distinguish between the thermal and fluorescence components of the radiation emitted by the samples. Early steps have been made toward the development of a theoretical model for calculating the vibration spectra of mono-substituted cyclopentane derivatives. A discussion is given of possible applications of these and other organic liquids to the development of a continuously tunable infrared laser and the generation of ultra-short infrared laser pulses. GRA

N73-15545# Hughes Aircraft Co., Culver City, Calif. Electronic Properties Information Center.
LIGHT EMITTING DIODES FOR LASER PUMPING Interim Report
Harvey V. Winston Jul. 1972 39 p refs
(Contract DSA900-72-C-1182)
(AD-750576; EPIC-IR-80) Avail: NTIS CSCL 09/1

The report reviews the published literature on the application of light emitting diodes to the pumping of solid-state laser rods. Because of the requirements of matching the LED output to the absorption bands of the active laser impurity ions, most work in this field has concentrated on the ternary alloy LED's such as gallium aluminum arsenide and gallium arsenic phosphide systems. Data tables on these materials are appended to the report. Author (GRA)

N73-15546# Naval Ordnance Lab., White Oak, Md.
CO2 LASER RADIATION ABSORPTION IN SF6-AIR BOUNDARY LAYERS
John D. Anderson, Jr., Jerry L. Wagner, and Joseph Knott 1 Aug. 1972 71 p refs
(AD-751016; NOLTR-72-172) Avail: NTIS CSCL 20/4

Previous investigators have shown that gaseous sulfur hexafluoride (SF6) is a strong absorber of radiation at 10.6 micrometers. This wavelength also corresponds to the output from common CO2 lasers. New experimental and theoretical results are presented for the 10.6 micrometers absorption coefficient and saturation properties of SF6-air mixtures at conditions near standard sea level. Variations with pressure, wavelength and temperature are measured. Results for 10 percent SF6-90 percent air at 1 atm show that such mixtures are strong absorbers of CO2 laser radiation, and that saturation intensities are larger than 10,000 watts/sq cm. Measurements of CO2 laser radiation absorption within boundary layers with SF6 injection are made on the sidewall of a small subsonic wind tunnel. The beam intensity is attenuated by several orders of magnitude due to absorption by the SF6. Author (GRA)

N73-15377* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DESIGN CONSIDERATIONS FOR A SPACE-BORNE OCEAN SURFACE LASER ALTIMETER
Henry H. Plotkin *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 27 p refs (For availability see N73-15369 06-13)
CSCL 14B

N73-15391* Tetra Tech, Inc., Pasadena, Calif.
FEASIBILITY OF MICROWAVE HOLOGRAPHY FOR IMAGING THE SEA SURFACE
Willard Wells *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 13 p (For availability see N73-15369 06-13)
CSCL 20E

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N73-15547 National Lending Library for Science and Technology, Boston Spa (England).
MEASUREMENT OF SPECIFIC SURFACE OF NON-SPHERICAL METALLIC POWDERS BY THERMAL DESORPTION OF NITROGEN
Y. S. Darievich and V. S. Pugin 27 Sep. 1972 8 p refs Transl. into ENGLISH from Poroshkovaya Met., Akad. Nauk Ukr. SSR (Moscow), no. 12, 1972 p 4-7 In ENGLISH and RUSSIAN (NLL-Trans-746-1287-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

Apparatus was devised to determine the specific surface of powders and porous bodies utilizing the thermal desorption of nitrogen method. The possibility of using this method to determine the properties of metallic powders and to investigate powder metallurgy processes is shown. Author

N73-15548 National Lending Library for Science and Technology, Boston Spa (England).
DETERMINATION OF THE SURFACE OF A SUPPORTED METAL FROM CHEMISORPTION DATA
O. M. Poltorak and V. S. Boronin 27 Sep. 1972 12 p refs Transl. into ENGLISH from Zh. Fiz. Khim. (Moscow), v. 46, no. 2, 1972 p 467-471 In ENGLISH and RUSSIAN
(NLL-Trans-746-1340-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

An attempt has been made to estimate the accuracy of chemisorption methods for determining the surface of metals, assuming that adsorption depends on the surface structure of the crystals. Estimates of the accuracy of the chemisorption method were made and at the same time the conditions of applicability of various methods for determining the surface of supported metals were determined. In many cases it was possible to describe the experimental isotherms for gas chemisorption on metals for mean degrees of coverage with sufficient

accuracy with the aid of equations containing two empirical constants relating to the heats of chemisorption. Author

N73-15549 National Lending Library for Science and Technology, Boston Spa (England).
STUDY OF CARBON DIOXIDE ADSORPTION ON METALLIC NICKEL FILMS
V. F. Khorkov and G. D. Lyubarskii 27 Sep. 1972 9 p refs Transl. into ENGLISH from Zh. Fiz. Khim. (Moscow), v. 46, no. 2, 1972 p 472-475 In ENGLISH and RUSSIAN
(NLL-Trans-746-1341-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The adsorption of carbon dioxide on nickel films is accompanied by an increase in the electron work function to 0.96 v. The effect of C02 on electrical resistance and photoelectric sensitivity of nickel films was studied. The results show that C02 adsorption on nickel films is accompanied by dissociation even at -78 C and that C02 adsorption on nickel powders is dissociative in nature. Author

N73-15550 National Lending Library for Science and Technology, Boston Spa (England).
EFFECT OF DYSPROSIUM OXIDE ON PROPERTIES OF NICKEL-ZINC FERRITES
V. A. Gorbatyuk and L. N. Tsybanenko 27 Sep. 1972 10 p refs Transl. into ENGLISH from Poroshkovaya Met., Akad. Nauk Ukr. SSR (Moscow), v. 11, no. 11, 1971 p 64-68 In ENGLISH and RUSSIAN
(NLL-Trans-746-1284-(9022.401)) Avail.: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

An analysis is made of the effect of dysprosium oxide on the physical properties of nickel-zinc ferrite materials used in industry. The technological conditions for synthesis of complex ferrites are described. It is stated that a decrease in the specific electrical resistivity of the samples with an increase in the dysprosium oxide content can be induced by increasing the grain size, forming a more conductive phase and by the emergence of donor levels in the forbidden band of the initial ferrite. Author

N73-15551 National Lending Library for Science and Technology, Boston Spa (England).
APPROXIMATE EVALUATIONS OF STRUCTURAL PARAMETERS OF POROUS Ni STRIP
T. S. Antipova, L. I. Stolyarenko et al 27 Sep. 1972 7 p refs Transl. into ENGLISH from Zavod. Lab. (USSR), v. 38, no. 2, 1972 p 203-205 In ENGLISH and RUSSIAN
(NLL-Trans-746-1342-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

Methods for controlling the expansion of porous nickel strip material during production are discussed. The effects of general porosity, coefficient of permeability, and value of diffusion or electric resistivity of the porous state are analyzed. The relationship between the microscopic parameters of porous nickel strips with specific dimensions and prescribed maximum pore radius is reported. Author

N73-15552 National Lending Library for Science and Technology, Boston Spa (England).
EFFECT OF HIGH PRESSURE ON PLASTICITY AND FRACTURE OF METALS
E. D. Martynov, B. I. Beresnev, D. K. Bulychev, K. P. Rodionov, and Iu. N. Riabinin 19 Aug. 1971 31 p Transl. into ENGLISH from the publ. "Mekhanizm Plasticheskoi Deformatsii Metallov" Kiev, Naukova Dumka, 1965 p 4-28
(NLL-NEL-TT-2190-(6075.461)) Avail: Natl. Lending Library, Boston Spa, Engl.: 3 NLL photocopy coupons

The effects of high pressure on plastic properties from the point of view of generation and development of defects in bodies undergoing deformation are reviewed. Discussed are: (1) extension under pressure; (2) generation of fracture cracks; and (3) healing of defects during deformation of metals under high pressure. Author

N73-15553 National Lending Library for Science and Technology, Boston Spa (England).
THE EFFECT OF BORON OXIDE ON THE PHASE COMPOSITION, POROUS STRUCTURE AND SORPTION PROPERTIES OF ALUMINUM OXIDE DURING THE PROCESS OF ITS HEAT TREATMENT
[1971] 9 p refs Transl. into ENGLISH from Vestsi Akad. Navuk Belarusk. SSR, Ser. Khim. Navuk (Minsk), v. 1, 1971 p 9-13
(NLL-M-22796-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

Experimental research is presented on the influence of B2O3 on phase composition, sorption, and porous structure of Al2O3 at different temperatures. Results show B2O3 additions to Al2O3 acts as a stabilizer at temperatures of 1000 K for phase compositions and sorption. However, the stabilizing action depends on the means by which the B2O3 is introduced. Author

N73-15554 National Lending Library for Science and Technology, Boston Spa (England).
BIMETAL WITH ELASTIC PROPERTIES FOR CURRENT CONDUCTING SPRINGS
V. K. Nikiforov, P. F. Zasukha, A. A. Ershov, and A. A. Severyukhin [1972] 10 p refs Transl. into ENGLISH from Stal' (Moscow), no. 6, 1972 p 549-551 In ENGLISH and RUSSIAN
(NLL-M-21498-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

It is proposed that the expensive tin-phosphor-bronze alloy Br OF-6.5-0.15 used for the manufacture of elastic current conducting components be replaced by a cheaper bimetallic product consisting of 50KhFA spring steel coated on both sides with L90 grade brass. A technique for producing this product by pack rolling has been developed. A trail batch of bimetal was used at an electric equipment works to make various elastic components. Tests for electrical conductivity, pressability, resilience and corrosion resistance showed that this material is a successful and cheaper substitute for the bronze alloy. Author

N73-15555 National Lending Library for Science and Technology, Boston Spa (England).
THE RELAXATION AND BRITTLE FRACTURE BEHAVIOUR OF HIGH-TEMPERATURE BOLTED JOINTS
A. Erker and K. H. Mayer 22 Aug. 1972 24 p refs Transl. into ENGLISH of Maschinenfabrik Augsburg-Nuernberg A.G. Werk, Nuernberg. Abt. Vem brochure, [1972]
(NLL-ESB-Trans-503-(3810.97)) Avail: Natl. Lending Library, Boston Spa, Engl.: 6 NLL photocopy coupons

Relaxation tests on high temperature bolted joints using the materials currently employed for steam turbine construction indicate that the results depend to a high degree on the initial conditions prevailing. With optimum production conditions, there are still very high residual stresses, above 540 C, after extremely long periods on tests with the Ni alloy NiCr20TiAl. Bolts made from 1% CrMoV steel are of importance, particularly at temperatures below 480 C. Notch impact bend test specimens produced from the relaxation test specimens and tested at room temperature do not enable any conclusions to be drawn regarding any significant reduction in deformation capacity prevailing at room temperature with any of the bolt materials investigated. During brittle fracture investigations on notched large bolts, steel X22CrMoV 12 1 exhibited more favorable behavior than that of steel X17CrMoVNb 12 1. Author

N73-15556# Joint Publications Research Service, Arlington, Va.
DUCTILITY OF TITANIUM ALLOYS AND ATOMIC ORDERING IN NICKEL CHROMIUM ALLOY
22 Nov. 1972 14 p refs Transl. into ENGLISH from Fiz. Metalov i Metalloved. (Sverdlovsk), v. 33, no. 4, 1972 p 846-848 and 887-890
(JPRS-57578) Avail: NTIS HC $3.00

Studies are reported concerning the beta-phase effect on ductility of two-phase titanium alloys and the calorimetric determination of atomic ordering effects in Ni2Cr alloy. For individual titles, see N73-15557 through N73-15558.

N73-15557 Joint Publications Research Service, Arlington, Va.
BETA-PHASE EFFECT ON DUCTILITY OF TWO-PHASE TITANIUM ALLOYS
N. Z. Pertsovskiy, G. V. Shakhanova, M. Ya. Brun, and A. B. Notkin *In its* Ductility of Titanium Alloys and Atomic Ordering in Nickel Chromium Alloy 22 Nov. 1972 p 1-6 refs (For

availability see N73-15556 06-17)

The microstructural features of deformation were studied for a number of two-phase titanium alloys. The results indicate that the capability of the beta-phase to be deformed in a large number of slip systems, with which its high ductility is usually associated, is not realized in the deformation of two-phase alloys of titanium containing the alpha phase as the basis. It was also found that the presence of the beta-phase increases the microheterogeniety of deformation which facilitates lowering of ductility in the two-phase alloys at room temperature. D.L.G.

N73-15558 Joint Publications Research Service, Arlington, Va.
CALORIMETRIC STUDY OF ATOMIC ORDERING EFFECTS IN ALLOY Ni2Cr
Ye. Z. Vintaykin, V. P. Itkin, and B. M. Mogutnov *In its* Ductility of Titanium Alloys and Atomic Ordering in Nickel Chromium Alloy 22 Nov. 1972 p 7-11 refs (For availability see N73-15556 06-17)

The heat of disorder in samples of alloy Ni2Cr was examined by the method of apparent heat capacity. The samples were ordered by preannealing to a known degree of ordering as determined neutronographically. The apparent heat capacity was measured with the aid of an adiabatic calorimeter with a continuous heat input. Three samples brought to an equilibrium degree of ordering at 500, 540, and 570 C, were investigated to determine the temperature function of enthalpy. The results of the tests are presented along with curves of the configuration enthalpy. The results indicate that ordering in the alloy proceeds at the fastest rate at 500 C which corresponds to supercooling of 90 degrees and a free energy gain of 90 cal/gm-atom.
D.L.G.

N73-15559# Joint Publications Research Service, Arlington, Va.
SELECTED TRANSLATIONS IN METALLURGY
18 Dec. 1972 29 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Tsvet. Met. (Ordzhonikidze), no. 4, 1972 p 53-63 and 128-132
(JPRS-57787) Avail: NTIS HC $3.50

Thermal decomposition kinetics of titanium tetrachloride, the interaction mechanism of titanium chloride with magnesium, and the composition and structural effects on mechanical properties of superplastic alloys are examined, including the superplasticity of VTZ-1 titanium alloy. For individual titles, see N73-15560 through N73-15563.

N73-15560 Joint Publications Research Service, Arlington, Va.
KINETICS OF THERMAL DECOMPOSITION OF TITANIUM TETRACHLORIDE
V. V. Krapukhin and E. A. Korolev *In its* Selected Transl. in Met. 16 Jan. 1973 p 1-8 refs (For availability see N73-15559 06-17)

The mechanism of the initial stage of thermal decomposition of TiCl4 is investigated with the adiabatic compression method. The device used for adiabatic compression and expansion is described, along with experimental conditions. The mechanism consists of a chlorine atom detachment. Author

N73-15561 Joint Publications Research Service, Arlington, Va.
ON THE QUESTION OF THE INTERACTION MECHANISM OF TITANIUM CHLORIDE WITH MAGNESIUM c06
V. E. Geger, I. M. Cheprasov, V. N. Dmitriyev, Ye. I. Fedotov, and N. Sh. Gafurova *In its* Selected Transl. in Met. 16 Jan. 1973 p 9-15 refs (For availability see N73-15559 06-17)

Magnesium thermal reduction as a method of producing titanium sponge by reacting liquid TiCl4 at excess pressure with magnesium is investigated. An improved method is proposed.
Author

N73-15562 Joint Publications Research Service, Arlington, Va.
EFFECT OF COMPOSITION AND STRUCTURE ON MECHANICAL PROPERTIES OF SUPERPLASTIC ALLOYS OF THE Al-Zn SYSTEM
I. I. Novikov, V. K. Portnoy, Yu. P. Kosikhin, N. A. Sinitsina, and G. S. Plekhanova *In its* Selected Transl. in Met. 16 Jan. 1973 p 16-21 refs (For availability see N73-15559 06-17)

The results of tests conducted on rolled sheets of zinc and aluminum binary alloys are presented. The interface is one of the most important structural properties of two-phase superplastic alloys. Sheets of superplastic alloys, properly processed, are competitive in terms of mechanical properties with standard alloys for deep stamping. Author

N73-15563 Joint Publications Research Service, Arlington, Va.
ON THE SUPERPLASTICITY OF VTZ-1 TITANIUM ALLOY
Ya. M. Okhrimenko, O. M. Smirov, L. V. Surmach, and M. M. Kuchinov *In its* Selected Transl. in Met. 16 Jan. 1973 p 22-26 refs (For availability see N73-15559 06-17)

The optimum temperature-rate conditions of deformation of VTZ-1 alloy in the superplastic state are established. The VTZ-1 alloy exhibits distinct properties of superplasticity. Author

N73-15564*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AUGER ELECTRON SPECTROSCOPY STUDY OF SURFACE SEGREGATION IN THE BINARY ALLOYS COPPER-1 ATOMIC PERCENT INDIUM, COPPER-2 ATOMIC PERCENT TIN, AND IRON-6.55 ATOMIC PERCENT SILICON
John Ferrante Washington Jan. 1973 23 p refs
(NASA-TN-D-6982; E-6984) Avail: NTIS HC $3.00 CSCL 11F

Auger electron spectroscopy was used to examine surface segregation in the binary alloys copper-1 at. % indium, copper-2 at. % tin and iron-6.55 at. % silicon. The copper-tin and copper-indium alloys were single crystals oriented with the /111/ direction normal to the surface. An iron-6.5 at. % silicon alloy was studied (a single crystal oriented in the /100/ direction for study of a (100) surface). It was found that surface segregation occurred following sputtering in all cases. Only the iron-silicon single crystal alloy exhibited equilibrium segregation (i.e., reversibility of surface concentration with temperature) for which at present we have no explanation. McLean's analysis for equilibrium segregation at grain boundaries did not apply to the present results, despite the successful application to dilute copper-aluminum alloys. The relation of solute atomic size and solubility to surface segregation is discussed. Estimates of the depth of segregation in the copper-tin alloy indicate that it is of the order of a monolayer surface film. Author

N73-15565*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMOGRAVIMETRIC STUDY OF THE REDUCTION OF OXIDES OF NICKEL AND CHROMIUM
Thomas P. Herbell Washington Jan. 1973 18 p refs
(NASA-TM-X-2688; E-7131) Avail: NTIS HC $3.00 CSCL 11F

The controlled hydrogen, carbon, and hydrogen-carbon reductions of the oxides of nickel and chromium were evaluated by thermogravimetric means. The materials studied were nickel (nickelous) oxide (NiO) and chromic sesquioxide (Cr2O3), mixed NiO-Cr2O3, and oxidized nickel - 20-percent chromium (Ni-20Cr). NiO was effectively reduced by all three atmospheres, Cr2O3 only by hydrogen-carbon, NiO-Cr2O3 by hydrogen and hydrogen-carbon, and oxidized Ni-20Cr by hydrogen and hydrogen-carbon and to a considerable extent by carbon alone. The results suggest that the presence of nickel promotes the reduction of Cr2O3. However, no definite explanation could be reached for the effectiveness of the hydrogen-carbon reduction of Cr2O3.
Author

N73-15566# Defence Standards Labs., Maribyrnong (Australia).
THE HIGH TEMPERATURE OXIDATION OF CHROMIUM
G. R. Johnston Oct. 1971 11 p refs
(TM-49) Avail: NTIS HC $3.00

Chromium and chromium alloys undergo severe oxidation at high temperatures. The breakdown of the Cr2O3 protective layer was previously assumed to be caused by volatile CrO3, recent evidence indicates that other volatile compounds must be taken into account. Author

N73-15567# National Aerospace Lab., Amsterdam (Netherlands).
INFLUENCE OF RESIDUAL COMPRESSIVE STRESSES UPON THE FATIGUE STRENGTH OF NOTCHED AND UNNOTCHED 7079 SPECIMENS
E. A. B. DeGraaf, F. A. Jacobs, and J. H. Nassette Nov. 1971 50 p refs

(NLR-TR-71105-U) Avail: NTIS HC $4.50

The influence of residual compressive stresses on the fatigue strength of notched and unnotched aluminum alloy 7079 specimens is reported. A comparative study of different types of mechanical surface treatments was conducted to achieve residual compressive stress effects at the surface of the test specimen. The fatigue behavior of the treated specimens was determined in constant amplitude tests. The benefit of the various treatments to improved operation is discussed. Author

N73-15568*# IIT Research Inst., Chicago, Ill.
FAILURE ANALYSIS OF ALUMINUM ALLOY COMPONENTS
Final Report, 1 Jun. 1971 - 15 Apr. 1972
Om Johari, Irene Corvin, and Joseph Staschke Washington NASA Jan. 1973 72 p refs
(Contract NAS1-10788)
(NASA-CR-2166; IITRI-B6114-7) Avail: NTIS HC $3.00 CSCL 11F

Analysis of six service failures in aluminum alloy components which failed in aerospace applications is reported. Identification of fracture surface features from fatigue and overload modes was straightforward, though the specimens were not always in a clean, smear-free condition most suitable for failure analysis. The presence of corrosion products and of chemically attacked or mechanically rubbed areas here hindered precise determination of the cause of crack initiation, which was then indirectly inferred from the scanning electron fractography results. In five failures the crack propagation was by fatigue, though in each case the fatigue crack initiated from a different cause. Some of these causes could be eliminated in future components by better process control. In one failure, the cause was determined to be impact during a crash; the features of impact fracture were distinguished from overload fractures by direct comparisons of the received specimens with laboratory-generated failures.
Author

N73-15569# Akademiya Nauk URSR, Kharkov.
EFFECT OF MAGNETIC RUPTURE ON LOW FREQUENCY ELECTROCONDUCTIVITY AND WEAKLY DAMPED ELECTROMAGNETIC WAVES IN METALS Fiziko-Tekhnicheskii Inst.
A. M. Kadigrobov 1971 45 p refs In RUSSIAN
(KHFTI-71-1) Avail: AEC Depository Libraries

The effects of magnetic rupture on low-frequency electroconductivity, wave vector of external electromagnetic fields, and electroconductivity of metals with closed Fermi surfaces are examined. The character of the propagation of weakly-damped electromagnetic fields originating in such metals is also considered. Expressions are formulated and expanded for the basic characteristics of conduction electron dynamics. Two cases are presented: (1) a coherent case, when purely quantomechanical calculation of the electroconductivity tensor is required, using a certain type of dispersion equation; and (2) a stochastic case, when the examination is conducted in terms of discrete random electron straying by classic trajectories of both zones. M.C.

N73-15570# Dow Chemical Co., Golden, Colo. Rocky Flats Div.
ISOTROPIC HIGH STRENGTH BERYLLIUM
Dennis R. Floyd 6 Jul. 1972 13 p refs
(Contract AT(29-1)-1106)
(RFP-1816) Avail: NTIS

A process for making high strength beryllium by a hot-pressing, extrusion, and upset-forging route is described. Isotropic compressive yield strengths of greater than 100,000 psi were achieved by forward-extruding to a 4 to 1 reduction in area at 1300 F followed by upset-forging at temperatures between 1000 and 1200 F and reductions in height between 40 and 60%. Both tensile and compressive data for hot pressed, hot pressed and extruded, and hot pressed, extruded, and forged beryllium are presented and discussed. Author (NSA)

N73-15571# Goodyear Atomic Corp., Piketon, Ohio.
METAL/ENVIRONMENT REACTIONS AT ELEVATED TEMPERATURES
Darryl J. Costin 13 Dec. 1971 59 p refs
(Contract AT(33-2)-1)
(GAT-T-1868) Avail: NTIS

A compilation of nine lectures given at the GAT Metallurgy Department seminar on metal/environment reactions at elevated temperatures is presented. Lectures were devoted to a semiquantitative analysis of point defect theory and to the kinetics of high temperature oxidation. In light of the appreciable amount of research on the various aspects of metal/gas reactions conducted in the gaseous diffusion industry, this series of lectures may serve as a supplement to pertinent project investigation.
Author (NSA)

N73-15572# Institut zur Erforschung Technologischer Entwicklungslinien, Hamburg (West Germany).
STATE OF THE ART AND FUTURE DEVELOPMENTS OF DISPERSION STRENGTHENED ALLOYS [STAND UND AUSSICHTEN DISPERSIONSGEHAERTETER LEGIERUNGEN]
Rolf Scharwaechter 1972 25 p refs In GERMAN
(ITE-Mitt-7/1972) Avail: NTIS HC $3.25

A survey is presented of dispersion hardened high temperature alloys. Methods of production and particle dispersion processes are discussed. Mechanical properties and creep strength of dispersion hardened alloys are compared with those of other alloys and future perspectives are analyzed. Rupture strength can be improved by a combination of dispersion hardening and the crystal mixing technique. Author (ESRO)

N73-15573# Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
FORM FACTORS OF FLAT BARS FOR FATIGUE STRENGTH TESTS [FORMZAHLEN VON FLACHSTAEBEN FUER SCHWINGFESTIGKEITSVERSUCHE]
H. Ostermann 8 Dec. 1971 8 p refs In GERMAN
(LBF-TM-61/71) Avail: NTIS HC $3.00

The form numbers of flat notched specimens for fatigue tests, determined by stress optical methods and by the finite element method, are compared. It is suggested that the finite element method should be used to determine the form numbers, since stress problems are now more generally computed by this method. Author (ESRO)

N73-15574# Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
FATIGUE STRENGTH AND FATIGUE LIFE OF UNNOTCHED AND NOTCHED FLAT BARS MADE OF THE TITANIUM ALLOY Ti6Al4V (3.7164.1) [ZEIT- UND BETRIEBSFESTIGKEIT UNGEKERBTER UND GEKERBTER FLACHSTAEBE AUS DER TITANLEGIERUNG Ti6Al4V (3.7164.1)]
H. Ostermann and C. Matschke 15 Dec. 1971 16 p refs In GERMAN
(LBF-TM-62/71) Avail: NTIS HC $3.00

The fatigue strength of axially loaded, notched and unnotched specimens of the alloy Ti6A14V (Ti6-4) at room temperature, was investigated and compared with the published values for Ti8Al1Mo1V (Ti8-1-1) and Ti5Al2.5Sn (Ti5-2.5). One-step tests with specimens of form numbers 1.0 and 3.6 were plotted in Haigh diagrams, for a survival probability of 50. Fatigue strength tests were carried out on axially loaded notched specimens of form number 3.6. Author (ESRO)

N73-15575# Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
FATIGUE STRENGTH OF NOTCHED FLAT BARS MADE OF Ti6Al4V (3.7164.1) IN THE RANGE FROM 1 MILLION TO 10 MILLION STRESS CYCLES [SCHWINGFESTIGKEIT GEKERBTER FLACHSTAEBE AUS Ti6Al4V (3.7164.1) IM BEREICH ZWISCHEN 1 MILLION UND 10 MILLIONEN LASTSPIELEN]
H. Ostermann and C. Matschke 20 Dec. 1971 9 p refs In GERMAN
(LBF-TM-63/71) Avail: NTIS HC $3.00

Fatigue tests were carried out on axially loaded flat bars with form number 3.6 made of Ti6Al4V (Ti 6-4), to investigate fatigue strength up to 10 million stress cycles, with a lower limit of 1 million cycles. The results are given in the form of fatigue diagrams for a survival probability of 50 for the cases of cyclic stress and incremental stress. Author (ESRO)

N73-15576# National Aerospace Lab., Amsterdam (Netherlands).
APPLICABILITY OF FRACTURE TOUGHNESS DATA TO SURFACE FLAWS AND TO CORNER CRACKS AT HOLES
D. Broek, A. Nederveen, and A. Meulman Jan. 1971 60 p refs Sponsored by Neth. Aircraft Develop. Board
(NLR-TR-71033-U) Avail: NTIS HC $5.00

Fracture toughness tests were carried out on 7075-T6 and 2024-T3 Al alloys. The specimens contained surface flaws, corner cracks, or corner cracks at holes. They did not show a constant K sub Ic, and it is pointed out that basically there is no unique K sub Ic for surface flaws. Toughness data of surface flaw specimens can be used to predict the residual strength in case of elliptical flaws in more complicated geometries.
Author (ESRO)

N73-15577# National Aerospace Lab., Amsterdam (Netherlands).
STUDY OF THE GROWTH OF STRESS CORROSION CRACKS IN THE ALUMINIUM ALLOY 7075. PART 1: INVESTIGATION ON THE CORROSIVE MEDIUM
A. Hartman, J. W. Lievers, and W. J. VanderVet Sep. 1971 38 p refs Sponsored by Neth. Agency for Aerospace Programs
(NLR-TR-71090-U-Pt-1) Avail: NTIS HC $4.00

Stress corrosion cracking of 7075 aluminum alloy was investigated by means of bend tests on short transverse pre-cracked specimens. It was found that in 3% NaCl-solution the S.C.C. behavior was neither significantly affected by the ph in the range 3-10 nor in almost neutral solution by addition of chromate. In distilled water on the other hand time to failure was about ten times longer. Replica and transmission electron microscopy were applied to studies of the fracture surface and the micro structure.
Author (ESRO)

N73-15578# British Steel Corp., London (England). Metallurgy Dept.
INTERNATIONAL COMPARATIVE CREEP RUPTURE PROGRAMME
D. Burton, J. C. Guest, J. Hacon, and A. Higginbottom Jun. 1972 18 p refs Presented at Ger. Creep Conf., Dusseldorf, 3-5 May 1972
(PB-211174; MG/QE/404/72) Avail: NTIS HC $3.00 CSCL 11F

Fifty-eight testing laboratories in 9 countries are participating in an international creep rupture testing program on 2 steels, 24 Cr-Mo-V5 5 and Type 316. The objectives of the program are to establish by statistical analysis the causes of significant variations in results obtained from different laboratories due to changes in testing technique. The testing program is not yet complete and this paper summarizes the available test data up to durations of 10,000 hrs. A preliminary analysis of the data is included, but it has not yet been possible to correlate variations in testing technique with the deviations in results. It has been shown however that temperature control is not always within the prescribed standard limits.
Author (GRA)

N73-15579# British Steel Corp., London (England). General Steels Div.
THE ANALYSIS OF MILD AND LOW ALLOY STEELS BY A MULTI-CHANNEL ARL 72000 X-RAY SPECTROMETER
A. A. Tunney and H. Hughes Jun. 1972 23 p
(PB-211170; GS/TECH/240/1/71/C) Avail: NTIS HC $3.00 CSCL 11F

The performance of the ARL 72000 multi-channel X-ray spectrometer was investigated for the analysis of Si, Mn, P, S, Cr, Mo, Ni, Cu, Nb, Sn, Ti, V, Zr in mild and low alloy steels. The overall reproducibility of the technique and the contribution of various sources of error has been determined experimentally. The main source of error is associated with setting up chosen top and bottom values for each element. Reproducibility however can be much improved by using a computer program which automatically compensates for changes in setting up values compared with those used in the original calibration.
GRA

N73-15580# California Univ., Los Angeles. School of Engineering and Applied Science.
NEW TECHNIQUES FOR THE SYNTHESIS OF METALS AND ALLOYS
R. F. Bunshah Sep. 1972 45 p refs
(Grant DAHC15-70-G-0015; ARPA Order 1643)
(AD-750413; UCLA-ENG-7288; SATR-4) Avail: NTIS CSCL 13/8

The main tasks are the preparation and testing of the various alloys, ceramics and dispersion strengthened alloys. A new process for the synthesis and high rate deposition of compounds was developed. The process is called Activated Reactive Evaporation. During the reporting period, further work was done relating the synthesis, stoichiometry and microstructure (internal and external) for TiC, ZrC and (Hf-3Zr)C. In addition, considerable development work was done on two important experimental equipment items, i.e., the Laser Pool Height Monitor and the Pressure Barrier.
GRA

N73-15581# Rutgers Univ., New Brunswick, N.J. Materials Research Lab.
IMPORTANCE OF SLIP MODE FOR DISPERSION-HARDENED BETA TITANIUM ALLOYS Final Report, 1 Oct. 1971 - 31 Mar. 1972
T. Hamajima, G. Lutjering, and S. Weissmann Wright-Patterson AFB, Ohio AFML Jul. 1972 22 p refs
(Contract F33615-69-C-1322; AF Proj. 7353)
(AD-749932; AFML-TR-72-103) Avail: NTIS CSCL 11/6

The mechanical properties of Ti-7 Mo-7 and Ti-7 Mo-16 Al (in atomic per cent) were correlated to the microstructure. The mechanical properties of the alloy with low aluminum content, consisting of alpha - beta phases, were dependent on the size of the alpha particles. Small alpha particles functioned as typical hard agents in a dispersion-hardened system and the volume fraction of the particles controlled the ductility. Large alpha particles behaved like soft incoherent particles, the volume fraction having little effect on the inherent ductility of the alloy. This different behavior could be attributed to the dependence of strain-hardening behavior of alpha particles on particle size. The two-phase (beta Ti3Al) microstructure of the alloy with high aluminum content resulting from high-temperature aging at 900C exhibited a yield stress of 130 ksi and an elongation to fracture of 5%. The ductility of these microstructures was controlled by the volume fraction of the Ti3Al particles inducing homogeneous slip.
Author (GRA)

N73-15582# Army Weapons Command, Rock Island, Ill. Weapons Lab.
HOT HARDNESS INVESTIGATION OF REFRACTORY METALS AND ALLOYS
Cyrus H. Philleo and Donald H. Sale Sep. 1972 33 p refs
(DA Proj. 1T0-62105-A-328)
(AD-750593; SWERR-TR-72-63) Avail: NTIS CSCL 11/6

The investigation was conducted to determine the hardness of several refractory metals and alloys at temperatures from 70F to 2000F. Microhardness tests were made in vacuum under controlled conditions to provide comparable screening data for predicting the strengths of these materials in high-temperature applications such as gun barrel liners. Materials tested included tungsten, molybdenum, columbium, tantalum, columbium-base alloys, and tantalum-base alloys. Chromium plate and Cr-Mo-V steel, currently used in gun barrels, were also tested for comparison.
Author (GRA)

N73-15583# General Motors Corp., Indianapolis, Ind. Detroit Diesel Allison Div.
BERYLLIUM REINFORCED METAL MATRIX COMPOSITES STUDY PROGRAM Final Report, 24, Jun. 1971 - 24 May 1972
Robert W. Stusrud, Morris J. Tumey, Marvin Herman, and G. R. Sippel Aug. 1972 55 p refs
(Contract N00019-71-C-0324)
(AD-750764; DDAD-EDR-7518) Avail: NTIS CSCL 11/4

The program aimed to develop nondestructive inspection techniques for beryllium-titanium composites and to characterize beryllium-titanium composites fabricated by different techniques. The feasibility of producing sheet, tubes, bars and forging preforms of Be/Ti 6Al-4V composite material was demonstrated.
Author (GRA)

N73-15584# Alabama Univ., Birmingham. Dept. of Engineering Biophysics.
A STUDY OF GRAIN MORPHOLOGY IN ULTRAFINE GRAIN SIZE METALS AND ALLOYS Final Report

Jack E. Lemons Jul. 1972 38 p refs
(Contract DAAG46-71-C-0174; DA Proj. 1T0-62105-A-328)
(AD-748101; AMMRC-CTR-72-13) Avail: NTIS CSCL 11/6

Grain morphologies, as defined by the rigorous techniques of quantitative microscopy, were investigated for ultrafine grain size 1010 modified steel and titanium alloys. Microstructures were defined by optical, transmission electron, and scanning electron microscopy techniques. Dihedral angles around three grain triple points, sides per grain, mean grain intercepts, grains per unit area, homogeneity of microstructure and hardness were investigated as a function of processing history. The microstructural characteristics undergo a fundamental change as the mean grain intercept is reduced to submicron dimensions.
Author (GRA)

N73-15585# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INVESTIGATION OF THE HEAT RESISTANCE OF ST-4 TITANIUM ALLOY AND CERTAIN PROTECTIVE COATINGS ON IT
Z. I. Kornilova, D. V. Ignatov, and E. M. Lazarev 25 Aug. 1972 12 p Transl. into ENGLISH from Fiz. i Khimiya Obrabotki Materialov (USSR), no. 3, 1971 p 113-115
(AD-750646; FTD-HT-23-1118-72) Avail: NTIS CSCL 11/6

A kinetic and structural investigation was carried out of the oxidizability in the temperature interval of 700-1000 C of the ST-4 titanium alloy, unprotected and protected by coatings based on Si and Mo-Si. The Si coating consisted mainly of the compound Ti5Si3 and TiSi and TiSi2 traces; the Mo-Si coating consisted mainly of MoSi2 and of Mo5Si3. Author (GRA)

N73-15586# Battelle Columbus Labs., Ohio.
RESEARCH ON SYNTHESIS OF HIGH STRENGTH ALUMINUM ALLOYS Annual Report, 1 Jul. 1971 - 31 Jul. 1972
J. D. Boyd, D. C. Drennen, C. J. Martin, C. W. Price, D. S. Thompson, A. R. Rosenfield, and D. N. Williams Wright-Patterson AFB, Ohio AFML 11 Oct. 1972 110 p refs Prepared in cooperation with Reynolds Metals Co., Richmond, Va.
(Contract F33615-71-C-1805)
(AD-750140; AFML-TR-72-199) Avail: NTIS CSCL 11/6

The objective of Task A is to provide increased strength and fracture resistance in aluminum alloys by optimizing the precipitate microstructure. To control the size and distribution of the intermediate precipitates in some high-strength 7000 and 2000 series alloys, several alloys were cast and their precipitate microstructures characterized by microscopy after homogenization treatments at various times and temperatures. Homogenization treatments were selected to produce a fine and a coarse intermediate precipitate. The objective of Task B is to develop a recrystallized microstructure in wrought high-strength aluminum alloys during hot working. Recrystallization occurred along the grain boundaries in the 2024 alloy only at the highest upset rate (8.8 inch/sec) and the highest temperature (925F). Preliminary microscopy results indicate that the intermediate precipitate in 2024 may not be stable during hot working.
Author (GRA)

N73-15587# Dayton Univ., Ohio. Research Inst.
RESEARCH AND DEVELOPMENT OF RARE EARTH-TRANSITION METAL ALLOYS AS PERMANENT-MAGNET MATERIALS Semiannual Interim Technical Report, 1 Jan. - 30 Jun. 1972
Alden E. Ray and Karl J. Strnat Aug. 1972 82 p refs
(Contract F33615-70-C-1625; AF Proj. 7371)
(AD-750746; UDRI-TR-72-41; AFML-TR-72-202) Avail: NTIS CSCL 11/6

The results of thermomagnetic analyses of the R2(Co(1-x) Fe(x)) 17 phases with R = Ce, Pr, Sm, Y, and MM above room temperature are reported, as well as the results of room temperature saturation magnetization for the phases with R = Ce, Pr, Nd, Sm, and Y. The magnitude of the magnetocrystalline anisotropy has been measured on a large number of magnetically aligned powder specimens for the ternary phases with R = Ce, Pr, Sm, Y, and MM. The phase Ce2(Co(0.5)Fe(0.5)) 17 has been re-examined by metallographic, X-ray diffraction, and electron microprobe analyses to explain the unusual thermal and magnetic transitions observed by DTA and TMA for the iron-rich Ce2(Co(1-x)Fe(x))17 phases with 0.4 < or = x < or = 0.7. The neodymium-cobalt alloy system has been re-examined and a revised phase diagram is proposed. The results of some preliminary sintering experiments using NdCo5 and DiCo5 as base metals and 60 Sm/40 Co and 70 Pr/30 Co alloys as sintering aids are reported. Author (GRA)

N73-15588# Frankford Arsenal, Philadelphia, Pa.
EFFECT OF INGOT THERMAL MECHANICAL PROCESSING TREATMENTS ON THE GRAIN SIZE AND PROPERTIES OF WROUGHT 7075 ALLOY
Jeffrey Waldman and Harry V. Sulinski 1972 16 p refs
(AD-750390) Avail: NTIS CSCL 11/6

A program was initiated to investigate the effect of ingot processing parameters on the properties of wrought aluminum alloy products. The paper describes an investigation of the effect of ingot thermal mechanical processing treatments on the grain size and mechanical properties of wrought homogeneous 7075 alloy. Author (GRA)

N73-15589# California Univ., Los Angeles. School of Engineering and Applied Science.
THE PROPERTIES OF RARE EARTH METALS AND ALLOYS Semiannual Technical Report, 1 Mar. - 31 Jul. 1972
D. L. Douglas and J. D. Kuenzly Sep. 1972 30 p refs
(Grant DAHC15-70-G-0015; ARPA Order 1643)
(AD-750410; UCLA-ENG-7283) Avail: NTIS CSCL 11/6

The high-temperature oxidation behavior of Ni3Al (Ni-13 w/o Al) with and without additions of 0.5% yttrium has been studied over the range of 900 to 1200C in air. None of the commonly accepted rate laws were followed by the kinetics. Although the weight gains of samples containing yttrium were consistently 10 to 20% greater than those without yttrium, the steady-state scaling rates were identical. A quantitative X-ray diffraction technique was used to determine the kinetics of growth of the protective alpha-Al2O3 layer (one of several oxides formed). The alumina growth followed the parabolic rate law under all conditions studied. The presence of yttrium greatly increased the short-time scale adherence. At longer times, however, the outer layer of NiAl2O4 and unreacted NiO spalled off along with some of the inner AlO3 layer. Author (GRA)

N73-15590# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INVESTIGATION OF ANTIFRICTION PROPERTIES OF COPPER ALLOYED MAGNESIUM CAST IRONS
Yu. S. Lerner and A. A. Getman 25 Aug. 1972 15 p refs Transl. into ENGLISH from the publ. "Povysheniye Dolgovechnosti Litykh Materialov" USSR, 1969 p 59-72
(AF Proj. 7343)
(AD-750519; FTD-HC-23-1017-72) Avail: NTIS CSCL 11/6

The wear resistance of copper alloyed (0.54-1.45%) magnesium cast iron is investigated. The comparative data on wear resistance during the reciprocating motion of different friction pairs show the advantages of magnesium cast iron alloyed with 1.15% copper (wear coefficient K equals 0.35), over bronze OTsS 5-5-5 (K equals 1.57) and magnesium cast iron alloyed with 0.5% P (K equals 0.93). Wear resistance testing with hardened rollers of magnesium cast iron specimens, alloyed with 1.15% Cu (K equals 0.37), produced results which were twice higher than those of bronze specimens AKh 9-4 (K equals 0.74). GRA

N73-15591# Philco-Ford Corp., Newport Beach, Calif. Aeronutronic Div.
THE EFFECTS OF PRIOR DEFORMATION AND TRANSFORMATIONS ON THE MICROSTRUCTURE OF AN IRON-NICKLE ALLOY
Kanji Ono and Theodore J. Koppenaal Oct. 1972 37 p refs
(Contract N00014-70-C-0223; NR Proj. 031-742)
(AD-750716; TR-3) Avail: NTIS CSCL 11/6

The microstructure of an Fe-31.4% Ni-0.03% C alloy was examined via transmission electron microscopy as a function of thermomechanical treatment. The effects of prior deformation, rapid reversion to austenite and thermal cycling on the microstructure were investigated and operative strengthening mechanisms in specimens under various conditions were clarified.
Author (GRA)

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N73-15592 National Lending Library for Science and Technology, Boston Spa (England).
PRODUCTION OF FIBRES AND HIGH-POROUS NICKEL MATERIALS
Aleksander Cyunczyk and Janusz Ostrowski 27 Sep. 1972 9 p refs Transl. into ENGLISH from Rudy Metale Niezelazne (Katowice), v. 17, no. 4, 1972 p 138-140 In ENGLISH and POLISH
(NLL-TRANS-746-1381-(9022.401)) Avail: Natl. Lending Libraries, Boston Spa, Engl.: 1 NLL photocopy coupon

Single fibers, plaques, and highly-porous sintered materials were produced by reduction of a nickel salt with which an organic carrier was saturated. The carrier burnt away, and a metallic material of the initial shape and 80-90 percent porosity was obtained. A relationship between the diameter of the nickel fibers and the concentration of the saturating solution was established. Author

N73-15593*# Horizons, Inc., Cleveland, Ohio.
DEVELOPMENT OF THERMALLY STABLE PHOSPHONITRILE ELASTOMERS FOR ADVANCED AEROSPACE STRUCTURES Annual Summary Report, 24 Apr. 1971 - 23 Apr. 1972
Kennard A. Reynard and Selwyn H. Rose Jun. 1972 50 p refs
(Contract NAS8-25184)
(NASA-CR-124008; ASR-2) Avail: NTIS HC $4.50 CSCL 11D

Attempts to prepare low molecular weight, curable poly(fluoroalkoxyphosphazenes) have been successful. Derivatization of /Cl2PN/n polymer with alkoxides gave functionally reactive terpolymers. These terpolymers could be crosslinked with polyisocyanates at room temperature. Attempts to control molecular weight have not been as successful. The effects of (Cl2PN)3 monomer purity, use of (Cl2PN)3,4 mixture, and early termination of the bulk polymerization of (Cl2PN)3 were studied briefly. Both low and high molecular weight polymers were obtained. Reaction of NH4Cl with PCl5 with subsequent heating to give chain extension gave either gels or oils with molecular weights of several thousand. The stabilization of poly(fluoroalkoxyphosphazene) was investigated. The results generally were inconclusive, but acids were found to be deleterious while bases had little discernible effect. Improvements in stability by modification of end groups was inconclusive. Author

N73-15594# Research Inst. of National Defence, Stockholm (Sweden).
THE SEVENTH INTERNATIONAL REINFORCED PLASTICS CONFERENCE
Rune Flodin Apr. 1971 13 p refs In SWEDISH Conf. held at Brighton, Engl., 20-22 Oct. 1970
(FOA-2-C-2468-91) Avail: NTIS HC $3.00

Ongoing work at several British laboratories and factories in the field of carbon fiber development is briefly outlined. Activities include the production of reinforced and microwave plastic materials for radomes, electronic equipment and other construction purposes, and the fabrication of carbon fibers for composite materials and plastic reinforcement structures. Transl. by G.G.

N73-15595*# Rensselaer Polytechnic Inst., Troy, N.Y. Tribiology Lab.
CONSIDERATION OF MATERIALS FOR AIRCRAFT BRAKES
Marshall B. Peterson and Ting-Long Ho Apr. 1972 74 p refs
(Grant NGR-33-018-152)
(NASA-CR-121116) Avail: NTIS HC $5.75 CSCL 11D

An exploratory investigation was conducted concerning materials and their properties for use in aircraft brakes. Primary consideration was given to the heat dissipation and the frictional behavior of materials. Used brake pads and rotors were analyzed as part of the investigation. A simple analysis was conducted in order to determine the most significant factors which affect surface temperatures. It was found that where size and weight restrictions are necessary, the specific heat of the material, and maintaining uniform contact area are the most important factors. A criterion was suggested for optimum sizing of the brake disks. Bench friction tests were run with brake materials. It was found that there is considerable friction variation due to the formation and removal of surface oxide films. Other causes of friction variations are surface softening and melting. The friction behavior at high temperature was found to be more characteristic of the steel surface rather than the copper brake material. It is concluded that improved brake materials are feasible. Author

N73-15596# Joint Publications Research Service, Arlington, Va.
ABSTRACTS OF PAPERS FROM THE INTERNATIONAL SYMPOSIUM ON BORON
2 Jan. 1973 11 p refs Transl. into ENGLISH of the publ. "Mezhdunarodnyy simpozium po boru tezisy dokladov" Tbilisi, 1972 Conf. held at Tbilisi, USSR, 9-11 Oct. 1972
(JPRS-57879) Avail: NTIS HC $3.00

Abstracts are presented of papers given at the international symposium on boron held 9-11 October 1972 in Tbilisi. Author

N73-15597*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CRITERIA FOR SELECTING RESIN MATRICES FOR IMPROVED COMPOSITE STRENGTH
C. C. Chamis, M. P. Hanson, and T. T. Serafini 1973 34 p refs Presented at 28th Reinforced Plastics/Composites Inst., Washington, 6-9 Feb.; Sponsored by Soc. of Plastics Industry
(NASA-TM-X-68166; E-7226) Avail: NTIS HC $3.75 CSCL 11D

Criteria are presented which can be used a priori to select matrices to yield composites with improved unidirectional strength. The criteria evolved from an investigation including both theoretical and experimental efforts. Composite micromechanics were used in conjunction with suitable experiments and reference data to identify those matrix properties which influence composite strength properties. Composites of graphite fibers and low, intermediate and high-modulus resins were investigated. It was found that the area under the matrix stress/strain diagram limited to one percent strain is a good index for an a priori assessment of the matrix contribution to composite strength. The corresponding initial modulus is a useful parameter in translating matrix properties to composite properties. Matrix properties such as ultimate strength, ultimate elongation, toughness, and fracture toughness are misleading in translating matrix properties to composite strength. Author

N73-15598*# Scientific Translation Service, Santa Barbara, Calif.
SELECTIVE SURFACES AND COATINGS IN SOLAR RADIATION ENGINEERING
M. M. Koltun Washington NASA Jan. 1973 23 p refs Transl. into ENGLISH from Geliotekh., Akad. Nauk Uzb. SSR (Uzbek SSR), no. 5, 1971 p 70-80
(Contract NASw-2483)
(NASA-TT-F-14650) Avail: NTIS HC $3.25 CSCL 11C

Literature covering selective coatings for semiconductor photo-converters, for solar energy converters using white-black surfaces, and for cooling systems using solar energy are reviewed. The achievements in this field are summarized as the construction of a theoretical basis for the development of selective surfaces for solar energy conversion, and the fabrication of selective coatings with nearly optimal optical properties for all types of solar energy conversion systems. Author

N73-15599*# Solar, San Diego, Calif.
DEVELOPMENT OF FUSED SLURRY SILICIDE COATINGS FOR TANTALUM REENTRY HEAT SHIELDS Final Report
R. V. Warnock and A. R. Stetson Sep. 1972 191 p refs
(Contract NAS3-14315)
(NASA-CR-121022; RDR-1685-7) Avail: NTIS HC $11.75 CSCL 11B

A fused slurry silicide coating was devleloped to provide atmospheric reentry protection for the 90Ta-10W alloy. Overlay-

ing the silicide with a highly refractory glass greatly improved total lifetime and reliability of the coating system. Low pressure, slow cycle lifetimes in excess of 100 cycles were consistently recorded for 1700 K - 13 and 1300 N/sq m test conditions. A minimum of 25 cycles was obtained for 1810 K - 1300 N/sq m conditions. About 50 simulated reentry cycles (variable temperature, pressure, and stress) were endured by coated 1-inch miniature heat shield panels when exposed to a maximum of 1700 K and either internal or external pressure conditions. Author

N73-15600# Explosives Research and Development Establishment, Waltham Abbey (England).

OUTDOOR AND ACCELERATED WEATHERING OF ELASTOMERS AND PLASTICS: THE ASSESSMENT OF AN ACCELERATED WEATHERING TEST CHAMBER

J. Wright Mar. 1972 45 p refs

(ERDE-TR-107) Avail: NTIS HC $4.25

A range of elastomers and plastics were exposed in a Climatest accelerated weathering test chamber which uses a fluorescent source of ultraviolet radiation. The rates of deterioration of the materials exposed in the Climatest were compared with those of the same materials exposed out of doors at various sites including hot/wet and hot/dry tropical sites at JTRU Australia and temperature UK sites. The rates of deterioration obtained with the Climatest were usually about ten times faster than outdoor tropical exposures, slower than had been anticipated. Correlation between the rates of change of mechanical properties of materials exposed in the Climatest and out of doors was reasonably satisfactory, although visual failures apparent on specimens exposed out of doors were not necessarily reproduced by accelerated weathering cycles. Author (ESRO)

N73-15601# Army Materials and Mechanics Research Center, Watertown, Mass.

FABRICATION OF NEW COMPOSITE MATERIALS

James W. McCauley 1972 16 p refs

(AD-750353) Avail: NTIS CSCL 11/4

The feasibility of fabricating lamellar ceramic-based composites with synthetic fluorine mica has been demonstrated. Ba-mica/A1203 composites with greater than 99.5% of theoretical density have been produced. If the thermal shock resistance of these materials is also enhanced, potential applications include structural components in turbine engines and high temperature bearings. Reactive hot-pressing of K-mica with gamma-A1203 showed that fully dense K-mica/A1203 composites are not feasible by hotpressing up to 7000 psi. The work did demonstrate, however, that this technique allows for the fabrication of eutectic-like MgA1204/A1203 composites 700 C below the eutectic temperature. Author (GRA)

N73-15602# Hughes Aircraft Co., Culver City, Calif. Electronic Properties Information Center.

PROPERTIES OF OPTICALLY TRANSPARENT ADHESIVES Interim Report

Walter H. Veazie, Jr. Jun. 1972 111 p refs

(Contract DSA900-72-C-1182)

(AD-750571; EPIC-IR-76-Rev) Avail: NTIS CSCL 11/1

Optical, electrical, mechanical and thermal properties data for fifty commercially available transparent optical adhesives are given. Transmission, refractive index, radiation effects and limited processing data are also included. The data were selected from manufacturers, journal and government report literature. Ninety-six references are given in addition to a list of manufacturers of transparent optical adhesives. Author (GRA)

N73-15603# Army Materials and Mechanics Research Center, Watertown, Mass.

A HIGH TEMPERATURE ENGINEERING CERAMIC (Si3N4) BY POWDER METALLURGICAL METHODS

Michael W. Lindley and R. Nathan Katz Jun. 1972 10 p refs

(DA Proj. 1T0-62105-A-330)

(AD-750096; AMMRC-MS-72-5) Avail: NTIS CSCL 11/2

Silicon nitride has become a major structural ceramic material in the past decade. One form of this material, referred to as reaction-bonded silicon nitride, is of particular interest because it permits the production of ceramic components requiring little or no machining. The review discusses the application of powder metallurgical techniques to the fabrication of reaction-bonded silicon nitride, the nitridation process, and resultant properties. Author (GRA)

N73-15604# Army Materials and Mechanics Research Center, Watertown, Mass.

CARBON FIBERS: REEXAMINATION OF THE CRITICAL LOW-TEMPERATURE (200-300 C) STABILIZATION OF POLYACRYLONITRILE

Janet S. Perkins, Robert Sacher, Richard J. Shuford, R. E. Thomas, and Stanley E. Wentworth 1972 16 p refs

(AD-750362) Avail: NTIS CSCL 07/4

A carbon film from polyacrylonitrile is desired for use as a sheet-type reinforcing agent, e.g., in aircraft components such as drive shafts or spoilers where its planar isotropic properties will strengthen cut-out and joint areas. The report describes the authors' research on the production of carbon fibers from polyacrylonitrile, the most effective precursor. Knowing the chemistry will allow a rational modification of the process to permit extension of the method to polyacrylonitrile in film form, the most promising precursor for sheet carbon. GRA

N73-15605# Rutgers Univ., New Brunswick, N.J. Bureau of Engineering Research.

EFFECT OF HIGH PRESSURE ON PROPERTIES Final Report, 15 Nov. 1968 - 1 Jul. 1972

J. A. Saver and K. D. Pae Oct. 1972 7 p refs

(Contract DA-ARO(D)-31-124-G1078; DA Proj. 200-61102-B-bB)

(AD-750731; AROD-7928-6-C) Avail: NTIS CSCL 11/9

The report briefly summarizes the results of the research studies carried out during the last three and a half years concerning the effects of hydrostatic pressure on the mechanical behavior and mechanical properties of polymers. This research is summarized by briefly stating the problems studies and the general results obtained, and then listing the papers published, the progress reports submitted, the technical papers presented at conferences, the theses completed or partially completed, and the faculty directly or indirectly involved. Author (GRA)

N73-15606# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.

EVALUATION OF CORROSION INHIBITING PIGMENTS FOR ALUMINUM

William C. Marshall 30 Aug. 1972 12 p

(AD-749705; NADC-72159-VT) Avail: NTIS CSCL 11/3

Laboratory corrosion tests of inhibitors indicate that the inhibitors which contain hexavalent chromium gave the best protection for aluminum. However, potassium permanganate, also an oxidizing agent which deposits manganese dioxide on the aluminum, prevents corrosion. For screening inhibitors, a weighed aluminum coupon was immersed in a 5% sodium chloride solution containing 0.1% of inhibitor. The coupon was left undisturbed for approximately three weeks. It was then rinsed in distilled water, dried, and weighed and examined visually. Author (GRA)

N73-15607# Watervliet Arsenal, N.Y.

STRESS SINGULARITIES ASSOCIATED WITH A CRACK INCLINED TO A BIMATERIAL INTERFACE

San L. Pu, Raymond D. Scanlon, and Moayyed A. Hussain 1372 16 p refs

(AD-750367) Avail: NTIS CSCL 11/4

The purpose of the paper is to investigate the nature of the stress singularities associated with a crack inclined to a bimaterial interface. Emphasis is placed on the stress singularities since it was precisely the order of singularity in the homogeneous material that led to the definitions of stress intensity factors and fracture toughness. Author (GRA)

N73-15608# California Univ., La Jolla. Dept. of Applied Mechanics and Engineering Sciences.

A CONTINUUM THEORY FOR WAVE PROPAGATION IN LAMINATED COMPOSITES. CASE 2: PROPAGATION PARALLEL TO THE LAMINATES

G. A. Hegeimer and T. C. Bache Jul. 1972 38 p refs

(Grant AF-AFOSR-1957-70; AF Proj. 9782)

(AD-750504; AFOSR-72-2012TR; TR-6) Avail: NTIS CSCL 11/4

A continuum theory with microstructure for wave propagation in laminated composites, proposed in a previous work concerning normal propagation, is extended herein to the case of propagation parallel to the laminates. Model construction is based upon an asymptotic scheme in which dominant signal wavelengths are assumed large compared to typical composite microdimensions. A hierarchy of models is defined by the order of truncation of the obtained asymptotic sequence. To estimate accuracy, the phase velocity spectrum is investigated. As in the previous case, retention of all terms in the asymptotic sequence is found to yield the exact spectrum of Rytov. Spectral collation of the lowest order dispersive theory with exact first mode data gives excellent agreement. Based upon asymptotic expansions, a simplified first-order theory is also developed. Author (GRA)

N73-15609# Army Natick Labs., Mass.
HIGH TEMPERATURE POLYAMIDES FROM NEW HEXAHYDROBENZODIPYRROLE MONOMERS
John T. Stapler and Joseph Bornstein 1972 15 p refs
(AD-750380) Avail: NTIS CSCL 11/9

The Army has a high priority program to provide protective clothing to air and tank crewmen who are subject to possible exposure to intense heat and flame as a result of accident or enemy action. The paper reports on the synthesis of a new class of heterocyclic polyamides made possible by the successful synthesis and isolation of two new hexahydrobenzodipyrrole monomers. These newly prepared monomers reacted readily with diacid chlorides to form polyamides. A number of such polymers has been achieved with a selected group of diacid chlorides and a limited characterization by standard techniques provides data indicating that outstanding thermal properties are possible. GRA

N73-15610# Douglas Aircraft Co., Inc., Long Beach, Calif.
DEVELOPMENT OF A GRAPHITE HORIZONTAL STABILIZER Interim Technical Report, 1 Nov. 1971 - 30 Jun. 1972
George M. Lehman Jul. 1972 100 p refs
(Contract N00156-70-C-1321)
(AD-750778; MDC-J5621) Avail: NTIS CSCL 11/4

Vibration and static test setups are described and results are presented for a graphite-epoxy stabilizer assembly for the A-4 Skyhawk aircraft. Natural vibration frequencies, mode shapes, and structural damping data are presented for both the graphite stabilizer and the analogous production metal stabilizer. Each configuration was tested both with and without the production elevator installed. Structural influence coefficients were derived from the vibration test results and used to analyze the flutter speed of the A-4 aircraft using the graphite stabilizer. The flutter characteristics of the graphite stabilizer are expected to be improved, with the flutter speed being increased by 22 percent. The reduced weight of the graphite stabilizer is not expected to have a significant effect on the fin flutter characteristics. The stabilizer was tested statically under two critical load conditions, a localized leading-edge condition and an unsymmetrical bending condition. Finite element analyses are expected to determine the magnitudes of secondary shears and bending moments through the thickness of the laminate and their influences on ultimate strength of the stabilizer. Author (GRA)

N73-15611# Monsanto Research Corp., Dayton, Ohio.
ENGINEERING DATA ON ETHYLENE TERPOLYMER AS AN ADHESIVE FOR POLYCARBONATE COMPOSITE AIRCRAFT TRANSPARENCIES Technical Report, Feb. 1971 - Apr. 1972
George L. Ball, III, I. O. Salyer, C. J. North, and P. H. Wilken
Wright-Patterson AFB, Ohio AFML Jul. 1972 44 p refs
(Contract F33615-71-C-1321; AF Proj. 7381)
(AD-750814; MRC-DA-332; AFML-TR-72-109) Avail: NTIS CSCL 11/1

A transparent ethylene terpolymer adhesive was optimized and engineering data established to describe its utility in polycarbonate composite aircraft transparencies. The hydroxyl content was adjusted to provide for the best balance of toughness and adhesion versus elongation. Improvements in toughness were also derived through increases in molecular weight of the ethylene terpolymer by the use of heretofore unavailable materials and processes. It was shown that a higher level of hydroxyl (3.4%) in the terpolymer would be desirable. Primarily, by the use of partial crosslinking, the form-stable temperature (zero tensile strength) was increased to 178F. Most significant, however, was the excellent mechanical performance of material designated ETA 138200 over the spectrum of temperature from -65F to -165F. Author (GRA)

N73-15612# Battelle Memorial Inst., Columbus, Ohio.
THERMAL DEGRADATION OF HIGH TEMPERATURE POLYMERS AND COMPOSITES Final Report, 24 Jun. 1971 - 29 May 1972
W. H. Pfeifer and C. A. Gaulin 23 Jun. 1972 97 p refs
(Contract N60921-71-C-0250)
(AD-750396) Avail: NTIS CSCL 11/9

A study was performed to examine the thermal degradation process and char forming characteristics of a number of polyquinoxaline polymers. The techniques used were primarily of thermogravimetry, differential thermal analysis, and mass spectrometry. Constant heating rate and isothermal degradation experiments were carried out in vacuum, and to some extent, in air, the isothermal degradation rates were used to obtain an approximate activation energy for the degradation process. The quinoxaline-based polymers showed improved thermal stability and greater carbon yields compared to conventional polymers. Thermal degradation occurred in three discrete steps. Generalized degradation mechanisms that have been derived for these polymers from combined mass spectrometry and residue analysis results are described. Author (GRA)

N73-15613# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ELASTIC WAVES IN REINFORCED MATERIALS
15 Sep. 1972 22 p refs Transl. into ENGLISH from the Russian
(AD-750983; FTD-HT-23-1382-72) Avail: NTIS CSCL 11/4

The article concerns elastic waves in reinforced materials. It studies waves in anisotropic viscoelastic medium, energy dissipation in a reinforced medium, longitudinal shear waves, and longitudinal propagation of elastic waves. Author (GRA)

N73-15614# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
LINING OF HYDROSTATIC BEARINGS WITH SELF-SETTING PLASTIC AST-T
A. S. Efoyan 21 Aug. 1972 9 p Transl. into ENGLISH from Samoletostr. Tekh. Vozdush. Flota (USSR), no. 22, 1970 p 141-143
(AF Proj. 7343)
(AD-750525; FTD-HT-23-781-72) Avail: NTIS CSCL 11/3

Self curing AST-T resin had good antifriction properties, wear resistance and adhesion to steel, brass, and Al, and was therefore suited for lining hydrostatic bearings. Adhesion of AST-T to steel was improved by adding 20% methacrylic acid to the composition, but decreased with 30% graphite or powdered Al fillers. Author (GRA)

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

N73-15615# Pisa Univ. (Italy). School of Engineering.
NUMERICAL COMPARATOR FOR DETECTING ERRORS IN MEASUREMENT TRANSFORMERS [COMPARATORE NUMERICO PER IL RILIEVO DEGLI ERRORI DEI TRASFORMATORI DI MISURA]
Franco Nencioni and Antonio Longo Oct. 1970 10 p refs In ITALIAN Sponsored by CNR *Its* Ser. 28a
(Publ-1361) Avail: NTIS HC $3.00

The working principle of a numerical type instrument used to determine the vectorial relation between two large sine waves is described along with its application as a comparator for indicating error in transformation of angular measurements. The criteria used in the development of the numerical comparator are presented with emphasis on the circuits for analyzing the possible causes of error. A comparison is presented of the

experimental results obtained with this comparator with those of transformers in current use. Transl. by F.O.S.

N73-15616# National Research Council of Canada, Ottawa (Ontario).
THE NEUMANN BOUNDARY VALUE PROBLEM FOR THE HELMHOLTZ OSCILLATION EQUATION
R. Leis 1972 20 p refs Transl. into ENGLISH from Arch. Ration. Mech. Anal. (West Germany), v. 2, no. 2, 1958 p 101-113
(NRC-TT-1606) Avail: NTIS HC $3.00

Boundary value problems with the addition of Sommerfeld's radiation condition are considered. The properties of the potential functions of single or double layers are given, and the uniqueness of the problem is inferred. The solutions are assumed to be potential functions, and integral equations are derived for their weight functions. The question of eigensolutions is discussed, and the existence is proven by the capacity coefficient method. Author

N73-15617# National Research Council of Canada, Ottawa (Ontario).
ON DETERMINANTS OF MAXIMUM VALUE
U. Scarpis 1972 9 p ref Transl. into ENGLISH from Rend. Ist. Lombardo Sci. Lett. (Italy), no. 31, 1898 p 1441-1446
(NRC-TT-1605) Avail: NTIS HC $3.00

The existence of determinants of maximum value n to the n/2 power has been proved only for n = 2 to the lambda power. The law of formation of another class of these determinants, of which the former is a particular case, is presented. Author

N73-15618# Research Inst. of National Defence, Stockholm (Sweden).
THE INTERNATIONAL CONGRESS ON MATHEMATICS.
Bo Einarsson Apr. 1971 37 p refs In SWEDISH Congr. held at Nice, 1-10 Sep. 1970
(FOA-2-C-2470-11) Avail: NTIS HC $4.00

Comments and references are made to certain lectures on partial differential equations and numerical analysis given at the International Congress on Mathematics. Author

N73-15619# Research Inst. of National Defence, Stockholm (Sweden).
ESTIMATION OF LOCATION AND SCALE PARAMETERS FROM ORDERED SAMPLES, WITH NUMERICAL APPLICATIONS TO THE GUMBEL AND WEIBULL DISTRIBUTIONS
Arne Fransen Apr. 1971 19 p refs *Its* Vol. 5, No. 2
(FOA-P-B8010-11) Avail: NTIS HC $3.00; Res. Inst. of Natl. Def. (FOA), Stockholm 80, Sweden: Kr 5:

Coefficients for estimated values of location and scale parameters for the Gumbel and Weibull distributions are presented for sample sizes up to and including n = 19, using order statistics. Values of these coefficients are given in decimal form with seven places, of which at least five places are correct. Tabulated results include the means, variances, and covariances for both distributions. Additionally, the calculations are extended, and the accuracy of the values of the parameters is exemplified. Author

N73-15620*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF ELECTRICAL CONTACT OCCURRENCES BETWEEN ROLLING SURFACE WITH APPLICATION TO ELASTOHYDRODYNAMIC LUBRICATION
Steven M. Sidik Washington Jan. 1973 26 p refs
(NASA-TN-D-7134; E-7166) Avail: NTIS HC $3.00 CSCL 11H

A mathematical model enabling the relation of electrical contact occurrences between rolling surfaces to the mean thickness of an elastohydrodynamic lubricant film is discussed. A previous development by other authors is shown to contain an error invalidating their results. Some potentially useful approximations are developed for the case when the lubricant film is large with respect to the surface roughness. Complete solutions that are valid for all film thicknesses are not yet available. Author

N73-15621*# University of Southern Calif., Los Angeles.
A NEW APPROACH TO SINGULAR DISCRETE TIME FILTERING AND CONTROL
Richard S. Bucy, D. Rarpaport, and L. M. Silverman Oct. 1971 3 p refs Presented at the Proc. of the 3d Intern. Hawaii Conf. on System Sci., Honolulu, Hawaii, 13-17 Jan. 1970
(Grants NGL-05-018-044; AF-AFOSR-1244-67; AF-AFOSR-1622-69A)
(NASA-CR-130360; AD-741893; AFOSR-72-1088TR) Avail: NTIS HC $3.00 CSCL 12A

Theorems are given for the solution of invariant directions of the Riccati equation in the study of singular, linear, autonomous, discrete-time optimization problems of time filtering and control. A.L.

N73-15622# National Research Council of Canada, Ottawa (Ontario).
THE NYQUIST CRITERION FOR CONTROL LOOPS WHOSE BEHAVIOUR IS DESCRIBED BY LINEAR FUNCTIONAL DIFFERENTIAL EQUATIONS
B. Herz 1971 38 p refs Transl. into ENGLISH from Z. Angew. Math. Mech. (East Germany)
(NRC-TT-1612) Avail: NTIS HC $4.00

For the class of control loops under investigation the characteristic functions, crucial for stability, and a transfer function F (lambda) are established, the former being integral, but generally transcendental, the latter meromorphic, but generally nonrational. The function F (lambda), which can be obtained for imaginary values of lambda by observing the frequency response, is carefully studied with respect to both its growth behavior and its distribution of poles and zeros. A revised version of the Nyquist criterion is formulated and proved. The range of application of the Nyquist criterion is broadened, even for classical problems. Author

N73-15623# Sandia Labs., Livermore, Calif.
FINITE DIFFERENCE ALGORITHM FOR THE DIFFUSION EQUATION IN SPHERICAL COORDINATES
R. J. Kee Aug. 1972 38 p refs
(Contract AT(29-1)-789)
(SCL-DR-720017) Avail: NTIS

A finite difference algorithm is developed for the difference numerical solution of the steady or transient diffusion equation in spherical coordinates. Its excellent accuracy is demonstrated in 2 representations. Author

N73-15624# Brown Univ., Providence, R.I. Div. of Applied Mathematics.
AN APPLICATION OF MAXIMAL DISSIPATIVE SETS IN CONTROL THEORY
Marshall Slemrod 1972 20 p refs
(Contract N00014-67-A-0191-0009; Grant DA-ARO(D)-31-124-G1252; NR Proj. 041-397)
(AD-750784) Avail: NTIS CSCL 12/1

Consider the linear control system in Hilbert space given by dx/dt = Ax + Bu. Here A is the infinitesimal generator of a C sub o semigroup of bounded linear operators T(t), t greater than or equal to 0, on a real Hilbert space E. It is assumed that T(t) is such that for some constants M is greater than or equal to 1 and omega greater than 0. B is a bounded linear operator from a real Hilbert space H to E and N(B) is properly contained in H. Attempts are made to synthesize a feedback control u(t) = f(x(t)) whose active part is bounded, preserves the property of exponential asymptotic stability possessed by the uncontrolled system u = 0, and is suboptimal in some sense. The synthesis is formally obtained but leads to a nonlinear singular evolution equation for the state variable x(t). The theory of maximal dissipative sets is then applied to show that the state evolution equation possesses a unique solution when the synthesis is modified in an appropriate multivalued way at the singularities. Author

N73-15625# Aerospace Corp., El Segundo, Calif. Engineering Science Operations.
FITTING MULTISTAGE MODELS TO INPUT/OUTPUT DATA
Research Report, Sep. 1971 - Mar. 1972
Patrick L. Smith 10 Jul. 1972 36 p refs
(Contract F04701-72-C-0073)
(AD-750139; TR-0073(3901-03)-1; SAMSO-TR-72-216) Avail: NTIS CSCL 12/1

The paper treats the problem of fitting a linear multistage

model to a set of scalar input/output data. A Kalman filter is used to represent the system and the unknown parameters are estimated from the filter's measurement residuals by the maximum likelihood method. Many of the numerical problems associated with identifying the Kalman filter parameters are alleviated by rescaling the likelihood function to eliminate a singularity in its gradient. A recursive equation for the gradient of the likelihood function is derived. A numerical example is presented. Some extensions of these results to more general problems are discussed. Author (GRA)

N73-15626# Brown Univ., Providence, R.I. Div. of Applied Mathematics.
CONTROL OF DYNAMICAL SYSTEMS Progress Report, 1 Apr. 1971 - 31 Aug. 1972
J. P. LaSalle 20 Sep. 1972 38 p refs
(AD-750490; AFOSR-72-1995TR; PR-1) Avail: NTIS CSCL 12/1

The report covers the work which has been done on applications of modern control theory to the design of actual systems. Procedures have been developed that permit control system designers familiar with frequency domain techniques to understand and apply modern forms of control compensation and to indicate how the more modern theory can be used to improve system performance. Specific applications that have been looked at are the design of large scale power plants and aircraft control. Closely related to applications is also the work done on the development of numerical methods for synthesis and numerical solutions of the partial differentials that arise in stochastic control, monte carlo optimization, a computer program for parameter adaptive control when there is a time lag, digital compensation, iterative methods improving performance and for small noise stochastic control. New results have been obtained that should provide new methods for achieving guaranteed cost control and/or asymptotic stability where there are unknown time-varying parameters. Author (GRA)

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N73-15627 National Lending Library for Science and Technology, Boston Spa (England).
STATISTICAL CHARACTERISTICS OF RAINS
E. Strauch 1972 8 p refs Transl. into ENGLISH from Przegl. Geofiz. (Warsaw), no. 15, 1970 p 163-168
(NLL-M-20844-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

Microstructure measurements of precipitation are used to determine the statistical characteristics associated with the physical aspect of the precipitation-forming process in clouds. It is concluded from the study that the coefficient of variability of precipitation is a quantity which is characteristic for a given type of precipitation. In addition, it is shown that the autocorrelation coefficient drop concentration of particular sizes characterizes the coalescence process in clouds. D.L.G.

N73-15628 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
METEOROLOGICAL DATA. VOLUME 121, NO. 4: DAILY GROUND MAPS OF THE NORTHERN HEMISPHERE FOR 1971 [METEOROLOGISCHE ABHANDLUNGEN. BAND 121, HEFT 4: TAEGLICHE BODENKARTEN DER NORDHEMISPHAERE IM JAHRE 1971. TEIL IV, 4. VIERTELJAHR]
1971 34 p In GERMAN
(QR-4-Pt-4) Avail: Issuing Activity

Daily meteorological maps of the Northern Hemisphere presented contain atmospheric ground level observations for the fourth quarter in 1971. Transl. by G.G.

N73-15629 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
METEOROLOGICAL DATA. VOLUME 128, NO. 6: RESULTS OF THE SYNOPTIC SERVICE DURING 1972. DAILY AND MONTHLY WEATHER MAPS (GROUND, 500 mb, 850 mb), TABLES AND BRIEF SCIENTIFIC ARTICLES, JUNE [METEOROLOGISCHE ABHANDLUNGEN. BAND 128, HEFT 6: ERGEBNISSE DES SYNOPTISCHEN DIENSTES IM JAHRE 1972. TAEGLICHE UND MONATLICHE WETTERKARTEN (BODEN, 500 mb, 850 mb), TABELLEN UND KLEINERE WISSENSCHAFTLICHE AUFSAETZE, JUNI]
1972 205 p In GERMAN
Avail: Issuing Activity

Daily and monthly weather maps and data tables obtained in Berlin readings are presented for June, 1972. Included are brief scientific reports on weather prediction for European summer 1972, explanations to Berlin climatology charts, and definitions for pseudo-potential temperatures. Transl. by G.G.

N73-15630 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
METEOROLOGICAL DATA. VOLUME 133, PART 1: THE EUROPEAN CLIMATOLOGY 1972: WEATHER SATELLITE DATA FOR THE BERLIN RECEPTION AREA [METEOROLOGISCHE ABHANDLUNGEN. BAND 133, HEFT 1: DAS EUROPAEISCHE WETTERBILD 1972: WETTERSATELLITENDATEN AUS DEM BERLINER EMPFANGSBEREICH. TEIL I. 1. VIERTELJAHR]
1972 189 p In GERMAN
Avail: Issuing Activity

European climatological maps for the first quarter in 1972 are obtained from ESSA 8 photographs. All cloud mosaics include a geographical coordination net constructed from central picture points, respectively, sub-satellite points and median satellite orbital heights. Transl. by G.G.

N73-15631 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
METEOROLOGICAL DATA. VOLUME 128, NO. 5: RESULTS OF THE SYNOPTIC SERVICE DURING 1972. DAILY AND MONTHLY WEATHER MAPS (GROUND, 500 mb, 850 mb), TABLES, AND BRIEF SCIENTIFIC ARTICLES, MAY [METEOROLOGISCHE ABHANDLUNGEN. BAND 128, HEFT 5: ERGEBNISSE DES SYNOPTISCHEN DIENSTES IM JAHRE 1972. TAEGLICHE UND MONATLICHE WETTERKARTEN (BODEN, 500 mb, 850 mb), TABELLEN UND KLEINERE WISSENSCHAFTLICHE AUFSAETZE, MAI]
1972 188 p In GERMAN
Avail: Issuing activity

Daily and monthly weather maps and data tables obtained in Berlin readings are presented for May, 1972. Included are brief scientific reports on: New arrangement of weather map, snow data for Berlin winter 1971/72, and monthly mean data for snow covers measured in Berlin during 1971 through 1971/72 winters. Transl. by G.G.

N73-15632 Meteorological Office (Gt. Brit.).
NORTHERN HEMISPHERE MONTHLY MEAN 500-MILLIBAR AND 1000-500-MILLIBAR THICKNESS CHARTS AND SOME DERIVED STATISTICS (1951 - 1966)
B. J. Moffitt and R. A. S. Ratcliffe 1972 65 p refs
(Met-O-845C) Copyright. Avail: HMSO £2.35; PHI $9.11

The data from 1951 to 1966 were used to prepare charts of: (1) 500-mb monthly contours for each month of the year; (2) 1000-500-mb monthly mean thickness isopleths for each month of the year; (3) extreme values of 1000-500-mb thickness for each month; (4) mid-season (January, April, July and October) charts showing the variation of standard deviation of 500-mb height; (5) mid-season (January, April, July and October) charts indicating the areas of positive and negative skewness in the distribution of 500-mb height; (6) mid-season (January, April, July and October) charts showing the variation of standard deviation of 1000-500-mb thickness; and (7) mid-season charts indicating the areas of positive and negative skewness in the distribution of 1000-500-mb thickness. The charts of monthly average thickness and standard deviation may aid the forecaster in assessing the intensity of cold or warm outbreaks. F.O.S.

N73-15633 International Geophysical Year World Data Center A, Asheville, N.C.
METEOROLOGY DATA REPORT: HIGH ALTITUDE METEOROLOGICAL DATA. VOLUME 8, NUMBER 3

1972 236 p
Avail: National Climatic Center, Federal Building, Asheville, N. C. 28801 Attn: Publications $3.00

Wind and temperature measurements from all available high altitude meteorological sounding data are presented, along with computed values for pressure, density, and speed of sound. Local rawinsonde observations, current month means and standard deviations are also given. Author

N73-15634 National Lending Library for Science and Technology, Boston Spa (England).
A METEOROLOGICAL ANALYSIS OF SO2 POLLUTION IN SUMMER IN OSAKA
Akira Harada [1972] 7 p refs Transl. into ENGLISH from Kishocho Kenkyu Jiho (Tokyo), v. 21, 1969 p 37-40 No diagrams, etc.; to be used in conjunction with original paper
(NLL-M-20713-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

High concentration sulfur dioxide pollution occurred from morning to midday in summer where surface inversion was virtually absent. The mechanism of pollution near the surface was estimated by drawing a model diagram of the state of pollution in the upper air over the Osaka plain from surface streamlines and vertical wind distribution. It was seen from this that the formation of a thick polluted layer by the carrying of pollutants discharged from pollution centers by sea breezes produces high concentration pollution on the surface by substantially weakening the upward dilution of surface pollutants. This indicates the possibility of producing a high concentration at the surface even when atmospheric stability near the surface is low, thus this can be regarded as a mechanism for the generation of high concentration atmospheric pollution on the surface even in summer, when stability is low. Author

N73-15635 Freie Univ., Berlin (West Germany).
METEOROLOGICAL DATA. VOLUME 128, NO. 7: RESULTS OF THE SYNOPTIC SERVICE DURING 1972. DAILY AND MONTHLY WEATHER MAPS (GROUND, 500 mb, 850 mb), TABLES AND BRIEF SCIENTIFIC ARTICLES, JULY [METEOROLOGISCHE ABHANDLUNGEN. BAND 128, HEFT 7: ERGEBNISSE DES SYNOPTISCHEN DIENSTES IM JAHRE 1972. TAEGLICHE UND MONATLICHE WETTERKARTEN (BODEN, 500 mb, 850 mb), TABELLEN UND KLEINERE WISSENSCHAFTLICHE AUFSAETZE]
1972 179 p In GERMAN
Avail: Issuing Activity

Daily and monthly median synoptic meteorological data of the Northern Hemisphere are reported for July, 1972. Climatological measurements are obtained at ground, 500 mb, and 850 mb levels. Included brief scientific studies consider vapor pressure extremes since 1952, and atmospheric temperatures and relative atmospheric moisture content since 1960 in the greater vicinity of Berlin, Germany. Transl. by G.G.

N73-15636*# Wisconsin Univ., Madison. Space Science and Engineering Center.
MULTIDISCIPLINARY STUDIES OF THE SOCIAL, ECONOMIC AND POLITICAL IMPACT RESULTING FROM RECENT ADVANCES IN SATELLITE METEOROLOGY, VOLUME 3 Interim Report
Verner E. Suomi and Delbert D. Smith Aug. 1972 260 p refs
(Grant NGL-50-002-114)
(NASA-CR-129994) Avail: NTIS HC $15.00 CSCL 22B

A detailed analysis of the social, legal, organizational, and economic benefits of satellite meteorology is presented. Summaries are given on comprehension and use of weather information, economics of pea production, and the impact of long range weather forecasts. For individual titles, see N73-15637 through N73-15641.

N73-15637* Wisconsin Univ., Madison. Dept. of Economics.
ECONOMIC PROJECT PERSPECTIVES: AN OVERVIEW OF THE IMPACT RESULTING FROM RECENT ADVANCES IN SATELLITE METEOROLOGY
Kenneth R. Smith and Frederick H. Boness *In its* Multidisciplinary Studies of the Social, Econ. and Political Impact Resulting from Recent Advan. in Satellite Meteorol., Vol. 3 Aug. 1972 p 5-106 refs (For availability see N73-15636 06-20)
CSCL 22B

The impact of advanced satellite meteorology on long range weather forecasts, agriculture, commerce, and resource utilization are examined. All data are geared to obtaining a picture of various user needs and possible benefits. E.H.W.

N73-15638* Wisconsin Univ., Madison.
GOVERNMENT LIABILITY FOR METEOROLOGICAL SATELLITE DATA
Delbert D. Smith *In its* Multidisciplinary Studies of the Social, Econ. and Political Impact Resulting from Recent Advan. in Satellite Meteorol., Vol. 3 Aug. 1972 p 107-128 refs (For availability see N73-15636 06-20)
CSCL 04B

Possible legal ramifications to the U.S. Government as a result of utilization and distribution of meteorological satellite data are explored. E.H.W.

N73-15639* Wisconsin Univ., Madison. Dept. of Agricultural Journalism.
A STUDY OF COMPREHENSION AND USE OF WEATHER INFORMATION BY VARIOUS AGRICULTURAL GROUPS IN WISCONSIN Interim Report
Jean Longenecker Smith *In its* Multidisciplinary Studies of the Social, Econ. and Political Impact Resulting from Recent Advan. in Satellite Meteorol., Vol. 3 Aug. 1972 p 129-206 refs (For availability see N73-15636 06-20)
CSCL 04B

An attempt was made to determine whether current techniques are adequate for communicating improved weather forecasts to users. Primary concern was for agricultural users. Efforts were made to learn the preferred source of weather forecasts and the frequency of use. Attempts were also made to measure knowledge of specific terms having to do with weather and comprehension of terms less often used but critical to varying intensities of weather. E.H.W.

N73-15640* Wisconsin Univ., Madison. Dept. of Economics.
THE ECONOMIC IMPACT OF LONGER RANGE WEATHER INFORMATION ON THE PRODUCTION OF PEAS IN WISCONSIN
Kenneth R. Smith and Allan W. Torkelson *In its* Multidisciplinary Studies of the Social, Econ. and Political Impact Resulting from Recent Advan. in Satellite Meteorol., Vol. 3 Aug. 1972 p 207-220 ref (For availability see N73-15636 06-20)
CSCL 04B

The extent of benefits which will be realized in the pea industry as a result of improved long range weather forecasts are outlined. Particular attention was given to planting and harvesting operations. E.H.W.

N73-15641* Wisconsin Univ., Madison.
A REVIEW OF MULTIDISCIPLINARY CASE STUDIES ON THE IMPACT OF METEOROLOGICAL SATELLITES Interim Report
D. W. Martin and C. B. Tanner *In its* Multidisciplinary Studies of the Social, Econ. and Political Impact Resulting from Recent Advan. in Satellite Meteorol., Vol. 3 Aug. 1972 p 221-252 ref (For availability see N73-15636 06-20)
CSCL 22B

Case studies relating to the benefits of satellite meteorology are summarized in a series of tables. Data cover: (1) general areas within the process or operation being studied, (2) weather sensitive factors within general areas, (3) meteorological parameters which control individual factors and their time scale, and (4) meteorological parameters which are judged to be controlling. Meteorological variables and the extent to which they can be inferred by means of present satellite sensors are given. Author

N73-15642*# Wisconsin Univ., Madison. Space Science and Engineering Center.
MULTIDISCIPLINARY STUDIES OF THE SOCIAL ECONOMIC AND POLITICAL IMPACT RESULTING FROM RECENT ADVANCES IN SATELLITE METEOROLOGY, VOLUME 4 Interim Report
Verner E. Suomi and Delbert D. Smith Aug. 1972 206 p

refs
(Grant NGL-50-002-114)
(NASA-CR-130000) Avail: NTIS HC $12.50

Summaries, covering southern corn leaf blight, severe thunderstorms and tornadoes, and management of satellite data, are presented. For individual titles, see N73-15643 through N73-15645.

N73-15643* Wisconsin Univ., Madison.
A STUDY OF THE WEATHER SATELLITE PROGRAM MANAGEMENT AND ORGANIZATION SYSTEMS
Andre Delbeco and Alan Filley *In its* Multidisciplinary Studies of the Social, Econ. and Political Impact Resulting from Recent Advan. in Satellite Meteorol., Vol. 4 Aug. 1972 p 1-174 refs (For availability see N73-15642 06-20)

A description is given of the management and organizational system utilized by the Meteorological Satellite Program at NASA. The study focuses on the structure, process, and functioning of the program, making possible the successful linking of multiple systems of space science technology. By explicating the methods used and the conditions surrounding their usage it is expected that the lessons learned from this program will be of benefit to other organizations concerned with complex, developmental planning. Author

N73-15644* Wisconsin Univ., Madison.
TORNADO FORECASTING
Hans Rosendal *In its* Multidisciplinary Studies of the Social, Econ. and Political Impact Resulting from Recent Advan. in Satellite Meteorol., Vol. 4 Aug. 1972 p 175-192 refs (For availability see N73-15642 06-20)

Synoptic weather patterns conducive to severe thunderstorm and tornado formation are identified. The use of meteorological satellite observations to improve conventional forecast data and track such phenomena is discussed. E.H.W.

N73-15645* Wisconsin Univ., Madison. Dept. of Agronomy.
APPENDIX. SOUTHERN CORN LEAF BLIGHT ADDENDUM TO THE CASE STUDY: IMPACT ON CORN PRODUCTION FROM RECENT ADVANCES IN SATELLITE METEOROLOGY
R. H. Andrew *In its* Multidisciplinary Studies of the Social, Econ. and Political Impact Resulting from Recent Advan. in Satellite Meteorol., Vol. 4 Aug. 1972 p 193-199 (For availability see N73-15642 06-20)

The use of satellite meteorology to detect southern corn leaf blight is discussed. Specific data cover economic impact of improved forecasting on chemical control, sanitation procedures, production plans, and alternate uses and harvest of the corn crops. E.H.W.

N73-15646# Royal Netherlands Meteorological Inst., De Bilt.
MARINE CLIMATOLOGICAL SUMMARIES FOR THE MEDITERRANEAN AND SOUTHERN INDIAN OCEAN. VOLUME 4: 1964
1972 372 p refs
Avail: NTIS HC $20.75

Marine climatological summaries for 1964 for certain representative areas, i.e. the Mediterranean and the Southern Indian Ocean, including Australian waters. Eight areas were taken as representative of the Mediterranean and thirteen as representative of the Indian Ocean and Australian waters. Author

N73-15647# Japan Meteorological Agency, Tokyo.
AEROLOGICAL DATA OF JAPAN, JANUARY 1972
1972 327 p refs
Avail: NTIS HC $18.50

Daily upper air data, corrected for temperature error and curvature of the earth, are presented for Japan and its vicinity. The tables include standard pressure levels, temperature and humidity levels, wind levels, pilot-balloon data, and rocketsonde data. Author

N73-15648# Japan Meteorological Agency, Tokyo.
AEROLOGICAL DATA OF JAPAN, FEBRUARY 1972
1972 297 p refs
Avail: NTIS HC $17.00

Monthly upper atmospheric observations over Japan and its vicinity are presented. Standard pressure levels, temperature and humidity significance levels, wind significant levels, pilot balloon data, and rocketsonde data are included. J.A.M.

N73-15649# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics.
NUMERICAL TREATMENT OF AIR POLLUTION PROBLEMS
Guillermo Marshall Jul. 1972 8 p refs Presented at 3d Intern. Conf. on Numerical Methods in Fluid Mech., Paris, 3-7 Jul. 1972
Avail: NTIS HC $3.00

An attempt is made to simulate the emission-dispersion of an inert pollutant in the lower layer of the atmosphere in industrial zones by the numerical integration of the equations governing the conservation of mass, momentum, energy and pollutant (free and forced convection) in a two dimensional laminar flow. Some results are presented for different values of the non dimensional numbers using, as a test problem, the steady flow of a viscous incompressible fluid in a square domain, subjected to thermal gradients, and in the presence of a diffusion process. This process is determined by the continuous emission of a pollutant source located in one of the boundaries of the system. Author

N73-15650*# Environmental Research and Technology, Inc., Lexington, Mass.
CLOUD MICROSTRUCTURE STUDIES
Henry H. Blau, Jr., Mary Grace Fowler, David T. Chang, and Robert T. Ryan Nov. 1972 258 p refs
(Contract NAS5-21696)
(NASA-CR-130138; P-375) Avail: NTIS HC $15.00 CSCL 04B

Over two thousand individual cloud droplet size distributions were measured with an optical cloud particle spectrometer flown on the NASA Convair 990 aircraft. Representative droplet spectra and liquid water content, L (gm/cu m) were obtained for oceanic stratiform and cumuliform clouds. For non-precipitating clouds, values of L range from 0.1 gm/cu m to 0.5 gm/cu m; with precipitation, L is often greater than 1 gm/cu m. Measurements were also made in a newly formed contrail and in cirrus clouds. Author

N73-15651*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE EOLE EXPERIMENT: EARLY RESULTS AND CURRENT OBJECTIVES
Pierre Morel (CNRS, Paris) and William Bandeen Dec. 1972 36 p refs Submitted for Publication
(NASA-TM-X-66152; X-120-72-493) Avail: NTIS HC $4.00 CSCL 04B

The EOLE experiment with 480 constant level balloons released in the Southern Hemisphere is described. Each balloon floating freely at approximately the 200 mb level, is a precise tracer of the horizontal motion of air masses, the accuracy of which is limited only by the laminated structure of the stratospheric flow, within an RMS uncertainty of 1.5 m/sec. The balloons were found after 2 months to distribute at random over the whole hemisphere outside the tropics, irrespective of their original launching site. Early results of Eulerian and Lagrangian averages of the EOLE wind data are given for describing the mean 200 mb zonal and meridional circulations. The effect of the small scale eddies of two-dimensional turbulence has been studied with respect to the relative eddy diffusion of pairs of balloons and the relative dispersion of triangular clusters. New estimates of the RMS divergence of the 200 mb flow are given, together with their scale dependence which was found to be a logarithmic law. Author

N73-15652# Finnish Meteorological Inst., Helsinki.
CLIMATOLOGICAL DATA 1971
1972 112 p In FINNISH and ENGLISH
Avail: NTIS HC $7.75

Daily observations from 12 ground stations are presented, along with monthly and annual summaries from 149 stations. Atmospheric temperature, daily mean temperature, precipitation, snow depth, air pressure, humidity, wind direction and speed, and cloud cover are given in tabular form for 1971. J.A.M.

N73-15653# Maryland Univ., College Park.
LIMITED SHEAR ZONES: A HAZARD TO AVIATION

Robert J. Becker and Kenneth S. Gage [1971] 6 p refs Presented at Intern. Conf. on Aerospace and Aeron. Meteorology, Wash., D. C., 22 May 1972
(Contract AT(40-1)-4199)
(Conf-720535-2) Avail: NTIS

The dual hazard to aviation posed by turbulence and shear in a stably stratified environment in considered. The current state of our knowledge of instability and turbulence in stably stratified shear flow is briefly reviewed. The effect of concentrated vertical shear on aircraft performance is examined. A meteorological analysis of an incident of turbulence experienced by a 747 jumbo jet is also presented. Author

N73-15654# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Oct. 1972 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, OCTOBRE 1972]
R. Sneyers 7 Nov. 1972 16 p In FRENCH and DUTCH
Avail: NTIS HC $3.00

Meteorological parameters observed at different Belgian weather stations during October 1972 are given. ESRO

N73-15655# Transport and Road Research Lab., Crowthorne (England).
A PROGRAM FOR CALCULATING THIESSEN AVERAGE RAINFALL
A. O. Grigg 1972 21 p
(PB-211232; TRRL-LR-470) Avail: NTIS HC $3.00 CSCL 04B

A digital computer program is described for the determination of the mean rainfall over an area using the Thiessen method. The area can be of any shape and there is no necessity for the raingauge network to be the same for all storms. It is suggested that the program may have applications outside the field of hydrology. Author (GRA)

N73-15656# Colorado State Univ., Fort Collins. Fluid Dynamics and Diffusion Lab.
RESPONSE OF A TURBULENT BOUNDARY LAYER TO LATERAL ROUGHNESS DISCONTINUITIES
Hua Wang and E. C. Nickerson Jul. 1972 161 p refs
(Contract N00014-68-A-0493-0001; NR Proj. 062-414; Proj. Themis)
(AD-749944; CER71-72HW-ECN51; THEMIS-CER-TR-18) Avail: NTIS CSCL 04/2

The structure of the turbulent boundary layer on a flat plate consisting of alternate, longitudinal strips of smooth and rough (Sand paper, Grit 4) surfaces parallel to the direction of the flow has been investigated. Measurements of mean velocity, wall shear stress, turbulent intensities, turbulent shear stresses and energy spectra of the streamwise turbulent velocity were obtained. Author (GRA)

N73-15657# Systems Science and Software, La Jolla, Calif.
THE EFFECTS OF MESO-SCALE AND SMALL-SCALE INTERACTIONS ON GLOBAL CLIMATE Semiannual Technical Report, 15 Feb. - 14 Aug. 1972
15 Sep. 1972 202 p refs
(Contract DAHC04-71-C-0018; ARPA Order 1752)
(AD-750727; Rept-3SCR-72-1255; AROD-9951-4-A) Avail: NTIS CSCL 04/2

The results reported herein are the continuation of numerical studies of meso-scale phenomena related to the effects of orography on momentum and energy transfer in the atmosphere and the interaction of solar radiation with the Earth's atmosphere. GRA

N73-15658# Naval Weather Service Command, Washington, D.C.
SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS: SOUTHEAST ASIAN COASTAL MARINE AREAS. VOLUME 4: AREA 12, VICTORIA POINT; AREA 12, RANGOON; AREA 14, PAGODA POINT
Sep. 1972 486 p refs
(AD-750159) Avail: NTIS CSCL 04/2

The report contains data taken from marine surface observations in the areas of Victoria Point, Rangoon, and Pagoda Point. GRA

N73-15659# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FOUR-LEVEL METHOD FOR PREDICTING GEOPOTENTIAL IN THE TROPOSPHERE AND LOWER STRATOSPHERE TAKING RADIATION AND TURBULENT HEAT TRANSFER INTO CONSIDERATION
M. B. Galin, A. K. Popov, and S. I. Rudenko 28 Jul. 1972 25 p refs Transl. into ENGLISH from Vop. Gidrodinamicheskoi Teorii Klimata Dolgosrochnogo Prognoza Pogody (USSR), no. 12, 1966 p 21-34
(FTD Proj. 60103)
(AD-750496; FTD-MT-24-2156-71) Avail: NTIS CSCL 04/2

A four-level model of a baroclinic atmosphere is used to predict geopotential at isobaric surfaces at the 50, 150, 250, and 950 millibar levels for the Northern Hemisphere. An outline for use in making the calculations is presented, and examples of predictions for periods up to 3 days are included. Author (GRA)

N73-15660# Battelle Memorial Inst., Richland, Wash.
TAKE-OFF AND LANDING CRITICAL ATMOSPHERIC TURBULENCE (TOLCAT): EXPERIMENTS AND ANALYSIS Final Technical Report, Nov. 1969 - Oct. 1971
C. E. Elderkin, D. C. Powell, A. G. Dunbar, and T. W. Horst Apr. 1972 307 p refs
(Contract F33615-68-M-5009)
(AD-750131; AFFDL-TR-71-172) Avail: NTIS CSCL 04/2

Measurements of turbulence were made from various arrays of tower mounted sensors to demonstrate methods of describing the temporal and spatial character of turbulence. Measurement and data reduction techniques for sonic and three-propeller anemometers were optimized to assure true and accurate measurements of the vertical and two horizontal wind components. Both analog and digital magnetic tape field recording options were demonstrated to provide flexibility in measurement array configurations and to optimize recording capabilities for a variety of measurement requirements. Probability density functions, both individual and joint, were calculated for any pair of wind component variables, oriented in a preselected coordinate system, and optionally high pass filtered for various aircraft response applications. Power spectra of each time series and cross spectra for different wind components at the same point and for the same component at different points were calculated for time series optionally tapered or detrended. Plots of the space-time dependence of correlation functions were obtained from turbulence measurements taken from a logarithmically spaced line of towers, offering a means of determining the turbulence spectra for a given wind component encountered by an aircraft flying through a field of turbulence at a given wind speed. Author (GRA)

N73-15661# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
THE APPLICATION OF THE SCALE AUTOCORRELATION COEFFICIENT TO THE DETERMINATION OF THE HARMONIC CONTENT OF PERIODIC PHENOMENA: A METEOROLOGICAL AND A GEOPHYSICAL EXAMPLE Environmental Research Papers
V. L. Corbin, H. E. Moses, and A. F. Quesada 10 Aug. 1972 26 p refs
(AD-750476; AFCRL-72-0476; AFCRL-ERP-408) Avail: NTIS CSCL 04/2

In a previous work a scale autocorrelation coefficient was introduced that compares a function of time with itself when the scale of time is 'stretched.' It was shown that the scale autocorrelation could be used to determine ratios of frequencies which occur in phenomena with periodicities. In the present paper the authors review the properties of the scale autocorrelation coefficient and apply it to the finding of some of the ratios of the frequencies in atmospheric pressures measured daily for 8766 days. The authors also apply it to the measurements of the International Magnetic Character Figure, C(i), which was measured daily for 27,258 days. The authors regard these applications as the first test of the utility of the scale autocorrelation coefficient. The results indicate that the scale autocorrelation coefficient may indeed prove to be a valuable supplement to the use of the usual autocorrelation coefficient and the Fourier transformation of time-dependent functions. Author (GRA)

N73-15662# Weather Science, Inc., Norman, Okla.
STUDIES OF RAIN CYCLES OF WARM CUMULI
Joe J. Sutherland and D. Ray Booker 15 Jun. 1972 37 p refs
(Contract F19628-70-C-0228; AF Proj. 7605)
(AD-750889; WR201; AFCRL-72-0350; SR-2) Avail: NTIS CSCL 04/2

During September 1971, a field experiment was held near Patrick Air Force Base, Florida, to study the life cycles of natural and hygroscopically seeded warm tropical cumuli. Measurements of rain at the cloud base with the recalibrated RR40 raindrop spectrometer have shown the following characteristics. Seeding-affected rain appears to be initially visible from seven to ten minutes after seeding. The seeding effects take the form of an increase in the concentration of large drops and an apparent increase in the duration of the seeded showers. Author (GRA)

N73-15663# Lockheed Missiles and Space Co., Sunnyvale, Calif. Biotechnology.
STUDY OF FACTORS AFFECTING REACTIONS IN ENVIRONMENTAL CHAMBERS Final Report on Phase 1
Ralph J. Jaffe 20 May 1972 113 p refs
(Contracts CRC-APRAC-CAPA-1-69(1-71); EPA-68-02-0038)
(PB-212715; LMSC-A997745) Avail: NTIS HC $3.00 CSCL 07E

The results are presented of factors affecting environmental chambers used to study photochemical reactions in the lower atmosphere. Described are the facilities, the chamber, the light source, and some photochemical reactions. The work has shown the practicality of operating an environmental chamber externally illuminated by a collimated beam of light from a xenon arc lamp. It has also demonstrated that a vacuum chamber pump-down of the environmental chamber is a feasible method of chamber cleaning. Analytical chemistry methodology was demonstrated for the photochemical reaction products of interest. GRA

N73-15382* National Weather Service, Silver Spring, Md.
DATA REQUIREMENTS IN SUPPORT OF THE MARINE WEATHER SERVICE PROGRAM
J. Travers, Robert W. McCaslin, and M. Mull *In its* Sea Surface Topography from Space, Vol. 1 Feb. 1972 5 p (For availability see N73-15369 06-13)
CSCL 04B

N73-15384* New York Univ., N.Y. Dept. of Meteorology and Oceanography.
SKYLAB S193 AND THE ANALYSIS OF THE WIND FIELD OVER THE OCEAN
Willard J. Pierson, Jr. *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 20 p refs (For availability see N73-15369 06-13)
(Contracts NAS1-10090; N62306-70-A-0075-0007)
(Contrib-118) CSCL 04B

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N73-15664# Joint Publications Research Service, Arlington, Va.
INERTIAL GUIDANCE EQUIPMENT
12 Dec. 1972 30 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (Leningrad), no. 9, 1972 p 83-103
(JPRS-57746) Avail: NTIS HC $3.50

The characteristics of inertial guidance systems are discussed. The subjects presented are: (1) minimizing errors of inertial guidance systems, (2) forces in an electrostatic gyroscope with spherical rotor, (3) compass motion of three axis gyrostabilizer, (4) parameters of electromagnetic load cell, and (5) nonuniformity of radial elastic field of symmetrical springs. For individual titles, see N73-15665 through N73-15669.

N73-15665 Joint Publications Research Service, Arlington, Va.
METHOD FOR MINIMIZING ERRORS OF AN INERTIAL GUIDANCE SYSTEM
G. A. Dzhagarov *In its* Inertial Guidance Equipment 12 Dec. 1972 p 1-7 refs (For availability see N73-15664 06-21)

The lateral velocity measurement errors of an inertial guidance system with a short functioning time, performing spatial navigation of a vehicle traveling with large accelerations, are discussed. The capacity of the system to compensate lateral errors produced by all forms of mass disbalances and constant gyroscope drift rates by means of rotation of the entrance axes of the gyroscopes in the plane of trajectory of the vehicle is demonstrated. Author

N73-15666 Joint Publications Research Service, Arlington, Va.
GENERATION OF FORCES IN ELECTROSTATIC GYROSCOPE (ESG) WITH SPHERICAL ROTOR
G. F. Drobyshev and V. V. Timofeyev *In its* Inertial Guidance Equipment 12 Dec. 1972 p 8-13 refs (For availability see N73-15664 06-21)

Electrical suspension of a ball is examined from the point of view of generation of forces with electrodes of different configuration. A finite equation for engineering calculations of the electrical forces, which takes into account the mutual effects of the potentials of adjacent electrode pairs, is derived as a result of the analysis. Author

N73-15667 Joint Publications Research Service, Arlington, Va.
EQUATIONS OF COMPASS MOTION OF A THREE-AXIS GYROSTABILIZER IN THE GYROCOMPASS MODE
I. A. Mikhalev and V. V. Ryabtseva *In its* Inertial Guidance Equipment 12 Dec. 1972 p 14-17 refs (For availability see N73-15664 06-21)

The equations of compass motion of a triaxial gyrostabilizer in the gyrocompass mode are derived with consideration of the error of initial placement of the platform in the horizontal plane. The stability of motion is analyzed. Author

N73-15668 Joint Publications Research Service, Arlington, Va.
SELECTION OF PARAMETERS OF AN ELECTROMAGNETIC LOAD CELL OPERATING ON DC **c10**
P. G. Slomyanskiy *In its* Inertial Guidance Equipment 12 Dec. 1972 p 18-22 refs (For availability see N73-15664 06-21)

The effect of displacements of a suspended mass from its mean position on the accuracy of an electromagnetic load cell is examined. Recommendations are made concerning the selection of load cell parameters. Author

N73-15669 Joint Publications Research Service, Arlington, Va.
NONUNIFORMITY OF THE RADIAL ELASTIC FIELD OF SYMMETRICAL SPRINGS **c32**
A. S. Kelzon, A. P. Zobnin, and K. K. Malinovskiy *In its* Inertial Guidance Equipment 12 Dec. 1972 p 23-27 refs (For availability see N73-15664 06-21)

Symmetrical springs of identical stiffness are often used to create an elastic field between the rotor and housing of gyroscopic instruments. Such an elastic field is considered uniform and independent of preload. It is shown in this article that the elastic field does depend on preload, even for small deviations, and is nonuniform. Author

N73-15670# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario). Behavioural Sciences Div.
MAN AND AUTOMATION IN CANADIAN FORCES TERMINAL AIR TRAFFIC CONTROL
L. G. Innes Feb. 1972 29 p refs
(DCIEM-825) Avail: NTIS HC $3.50

The human engineering aspects of the automation of the Canadian Forces IFR control center for terminal ATC are examined. Problems involved in the controller-computer interface are discussed against the background of experience of other ATC automation programs, and recommendations are made for controls and displays design. Communications requirements of controllers are identified and a communications management panel design is proposed. Suggestions are given for console design, acceptable temperature, humidity, noise and illumination levels, and room decor features are discussed. Author

N73-15671# Research Inst. of National Defence, Stockholm (Sweden).
STUDY OF A LASER GYRO
T. Barresjoe Apr. 1971 26 p refs In SWEDISH
(FOA-2-C-2467-54) Avail: NTIS HC $3.50

An investigation into the stability of a laser gyro with a Faraday cell is reported. Certain sources of error and difficulties are pointed out. Author

N73-15672# Research Inst. of National Defence, Stockholm (Sweden).
EXPERIMENTS WITH FLUIDIC COMPONENTS FOR INERTIAL ANGULAR RATE SENSORS USING THE VORTEX PRINCIPLE
J. Sundelin Apr. 1971 49 p refs In SWEDISH
(FOA-2-C-2466-54) Avail: NTIS HC $4.50

The development of a device for measuring angular rate based on a number of experimental models and capable of producing acceptable performance, is described. An account is given of its measuring performance with the results from a bought model for comparison. The knowledge collected shows that it has reached a stage corresponding to available foreign sources. The most important limiting requirement consists of the noise level, which in practice can hardly seem to be lower than 0.5 mm column of water. Author

N73-15673*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
APOLLO 15 MISSION REPORT: APOLLO 15 GUIDANCE, NAVIGATION, AND CONTROL SYSTEM PERFORMANCE ANALYSIS REPORT (SUPPLEMENT 1)
Sep. 1972 128 p refs Prepared by TRW Systems, Redondo Beach, Calif.
(Contract NAS9-12330)
(NASA-TM-X-68934; TRW-20029-H044-R0-00-Suppl-1; MSC-05161-Suppl-1) Avail: NTIS HC $8.50 CSCL 17G

This report contains the results of additional studies which were conducted to confirm the conclusions of the MSC Mission Report and contains analyses which were not completed in time to meet the mission report deadline. The LM IMU data were examined during the lunar descent and ascent phases. Most of the PGNCS descent absolute velocity error was caused by platform misalignments. PGNCS radial velocity divergence from AGS during the early part of descent was partially caused by PGNCS gravity computation differences from AGS. The remainder of the differences between PGNCS and AGS velocity were easily attributable to attitude reference alignment differences and tolerable instrument errors. For ascent the PGNCS radial velocity error at insertion was examined. The total error of 10.8 ft/sec was well within mission constraints but larger than expected. Of the total error, 2.30 ft/sec was PIPA bias error, which was suspected to exist pre-lunar liftoff. The remaining 8.5 ft/sec is most probably satisified with a large pre-liftoff planform misalignment. Author

N73-15674*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
APOLLO 16 MISSION REPORT. SUPPLEMENT 1: APOLLO 16 GUIDANCE, NAVIGATION, AND CONTROL SYSTEM PERFORMANCE ANALYSIS REPORT
Oct. 1972 70 p refs Prepared by TRW Systems, Houston, Tex.
(Contract NAS9-12330)
(NASA-TM-X-68931; MSC-07230-Suppl-1) Avail: NTIS HC $5.50 CSCL 17G

The results are reported of additional studies which were conducted to supplement conclusions drawn in the MSC Mission Report and analyses which were not completed in time to meet the Mission Report dealine. A detailed evaluation of the Abort Guidance System sensor assembly and results from the investigation of the X gyro loop anomaly are included. Further evidence is presented substantiating the excellent LM IMU performance obtained from preliminary indications. A detailed study is presented of the procedural changes implemented on Apollo 16 to diminish the number and duration of interruptions to the CSM DAP attitude maneuver during P20 Option 5 operations. Author

N73-15675# IIT Research Inst., Annapolis, Md.
ATCRBS PERFORMANCE ANALYSIS FOR JACKSONVILLE AIR ROUTE TRAFFIC CONTROL CENTER Final Report
Charles A. Gettier Apr. 1972 54 p refs
(Contracts DOT-FA70WAI-175; F-19628-71-C-0221; FAA Proj. 213-503-015; AF Proj. 649E)
(ECAC-PR-72-014; FAA-RD-72-33) Avail: NTIS HC $4.75

The occurrence of excessive interrogation signals (hot spots) within air traffic control sectors supervised by the Air Traffic Control Radar Beacon System is evaluated. On-site observations of air traffic displays are discussed. An analysis of the Jacksonville, Florida Air Route Traffic Control Center is presented. Author

N73-15676# IIT Research Inst., Annapolis, Md.
ATCRBS PERFORMANCE ANALYSIS: WASHINGTON AIR ROUTE TRAFFIC CONTROL CENTER Final Report
Maximilian Ware, Jr. Jun. 1972 61 p refs
(Contracts DOT-FA70WAI-175; F19628-71-C-0221; FAA Proj. 213-503-015; AF Proj. 649E)
(ECAC-PR-72-022; FAA-RD-72-34) Avail: NTIS HC $5.25

The occurrence of excessive interrogation signals (hot spots) within air traffic control sectors by the Air Traffic Control Radar Beacon System is evaluated. On-site observations of air traffic displays are discussed. An analysis of the Washington, D.C. center is presented. Author

N73-15677# IIT Research Inst., Annapolis, Md.
ATCRBS PERFORMANCE ANALYSIS FOR LOS ANGELES ARTCC Final Report
Charles A. Gettier Aug. 1972 44 p refs
(Contracts DOT-FA70WAI-175; F19628-73-C-0031; FAA Proj. 213-503-015; AF Proj. 649E)
(ECAC-PR-72-044; FAA-RD-72-36) Avail: NTIS HC $4.25

The occurrence of excessive interrogation signals (hot spots) within air traffic control centers by the Air Traffic Control Radar Beacon System is evaluated. On-site observations of air traffic displays are discussed. An analysis of the Los Angeles, California center is presented. Author

N73-15678# IIT Research Inst., Annapolis, Md.
ATCRBS PERFORMANCE ANALYSIS: KANSAS CITY AIR ROUTE TRAFFIC CONTROL CENTER Final Report
Maximilian Ware, Jr. Jun. 1972 28 p refs
(Contracts DOT-FA70WAI-175; F-19628-73-C-0031; FAA Proj. 213-503-015; AF Proj. 649E)
(ECAC-PR-72-023; FAA-RD-72-37) Avail: NTIS HC $3.50

The occurrence of excessive interrogation signals within air traffic control sectors supervised by the Air Traffic Control Radar Beacon System (ATCRBS) of the Federal Aviation Administration is evaluated. On-site observations of air traffic displays are discussed and the analyses of the air traffic electromagnetic environments using performance prediction model techniques are described. Each of the studies evaluates the possibility of hot spots affecting one of the following ATCRBS Air Route Traffic Control Centers: Jacksonville, Washington, New York, Kansas City, and Los Angeles. Author

N73-15679# Federal Aviation Administration, Washington, D.C. Flight Services Div.
MINIMUM ENROUTE IFR ALTITUDES OVER PARTICULAR ROUTES AND INTERSECTIONS
Nov. 1972 210 p
Avail: NTIS HC $12.50

The minimum enroute instrument flight rules altitudes over particular routes and intersections are presented. The data applies to airline operations in the United States, Alaska, and Hawaii. Author

N73-15680# Federal Aviation Administration, Washington, D.C. Systems Research and Development Service.
ENGINEERING AND DEVELOPMENT PROGRAM PLAN: ALL WEATHER LANDING Final Report, period ending 1 Oct. 1972
Oct. 1972 40 p refs
(FAA-ED-07-3) Avail: NTIS HC $4.00

This plan describes all FAA development activities funded in the all weather landing program including electronic and visual guidance, airborne systems, and data collection. It also discusses

related projects funded in other programs. The related projects include weather measurement, ground guidance and control, and fog dispersal. The program includes investigation of advanced technology as continuing and long term development, including work on advanced cockpit displays, airport lighting techniques and continued recording of actual Category III experience. Related long term efforts include applications of the MLS to all weather landing operations, advanced weather measuring and fog dispersal techniques. Author

N73-15681*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
POSITION DETERMINATION ACCURACY FROM THE MICROWAVE LANDING SYSTEM
Luigi S. Cicolani Washington Jan. 1973 39 p refs
(NASA-TN-D-7116; A-4176) Avail: NTIS HC $3.00 CSCL 17G

Analysis and results are given for the position determination accuracy obtainable from the microwave landing guidance system. Siting arrangements, coverage volumes, and accuracy standards for the azimuth, elevation, and range functions of the microwave system are discussed. Results are given for the complete coverage of the systems and are related to flight operational requirements for position estimation during flare, glide slope, and general terminal area approaches. Range rate estimation from range data is also analyzed. The distance measuring equipment accuracy required to meet the range rate estimation standards is determined, and a method of optimizing the range rate estimate is also given. Author

N73-15682# Institute for Telecommunication Sciences, Boulder, Colo. Inst. for Telecommunication Sciences.
ON THE PREDICTION OF LORAN-D
R. H. Doherty and J. R. Johler Sep. 1972 24 p refs
(AD-750006; OT/TRER-35) Avail: NTIS MF $0.95; SOD HC $0.30 as C1.60 OT/TRER-35 CSCL 17/7

Observations concerning the deployment of Loran D system in Germany are recorded and interpreted using the theory of propagation. The experiences gained from this mission are discussed and recommendations for future deployments are made. It is concluded that the use of propagation theory not only gives the system a prediction capability but also aids in the diagnosis and correction of system problems that arise during deployment, especially under conditions of severe interference levels. Author (GRA)

N73-15683# Army Foreign Science and Technology Center, Charlottesville, Va.
EXPERIENCE GAINED IN USE OF THE RDGV RADIO DISTANCE FINDER
V. O. Agnev 22 Jun. 1972 4 p Transl. into ENGLISH from Geodeziya; Kartografiya (USSR), no. 11, 1969 p 23-25
(AD-748866; FSTC-HT-23-782-72) Avail: NTIS CSCL 08/5

The RDGV radio distance finder set consists of three identical stations, each functioning both as a guiding station and as a guided station. Before departure for field work the constant corrections were determined for each pair of stations of the set, which made it possible to avoid interruption of the work in the event one of the stations should get out of order. Author (GRA)

N73-15684# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PILOT'S AND NAVIGATOR'S HANDBOOK FOR CIVIL AVIATION (SELECTED ARTICLES)
G. V. Markov and L. A. Strogskii 21 Jul. 1972 291 p Transl. into ENGLISH from the book "Spravochnik Pilota i Shturmana Grazhdanskoi Aviatsii" Moscow p 84-225 and 240-248
(AD-750493; FTD-MT-24-291-72) Avail: NTIS CSCL 01/2

The handbook is based both on U.S. and Soviet systems and includes instructions and operating procedures relative to the following: air navigation, international air routes, compass error, course systems, great circle navigation, various navigation instruments, Doppler radar system, azimuth and range system. Foreign (non-Soviet) electronic short-range navigation systems VOR, TACAN, VORTAC, DME, VRM-5 and consol systems, long-range navigation systems (CYTAC, DECCA, DECTRA), airborne KURS-MP-1 navigation and landing equipment, BSU-ZP airborne control system, the NL-10m navigation slide rule, and the NRK-2 navigation calculator are discussed. General information and trouble shooting instructions are given for the RBP-4, RPSN-2, GROZA, and ROZ-1 radar sets. Various methods of celestial navigation are discussed briefly. Author (GRA)

N73-15685# Northrop Corp., Norwood, Mass. Precision Products Dept.
A LONG-TERM GYROCOMPASS TEST Final Report, Nov. 1971 - Jun. 1972
Robert L. McLaughlin 15 Jul. 1972 27 p refs
(Contract F19628-72-C-0020; AF Proj. 7628)
(AD-750890; AFCRL-72-0555) Avail: NTIS CSCL 17/7

The work was undertaken as a joint effort between Air Force Cambridge Research Laboratories and Northrop to investigate certain gyrocompass performance characteristics. It has been realized that a rate sensing gyrocompass is sensitive to environmental influences and that these influences can affect the accuracy of the measurement in very subtle ways. Specifically the paper addresses gyrocompass resolution; long-term accuracy, statistical attributes of the gyro, and the gyro as a geophysical tool. Author (GRA)

N73-15686# Air Force Academy, Colo. Frank J. Seiler Research Lab.
ACTIVE CONTROL OF A PNEUMATIC ISOLATION SYSTEM
Dino A. Lorenzini Aug. 1972 11 p refs
(AD-750869; SRL-TR-72-0017) Avail: NTIS CSCL 17/7

A pneumatically isolated test platform has been modified to provide active control to the local gravity vector. A combination of sensors, including tiltmeters, angular accelerometers, seismometers, and a gyrocompass measure total platform motion between 0 and 100 Hz. Electrical-to-pressure transducers control the air pressure in the supporting cylinders for low-frequency stabilization. Small electromagnetic shakers provide the necessary mid-frequency control forces. The pneumatic supports themselves provide excellent passive isolation against higher frequency disturbances. This active platform control scheme will be used to investigate the effects of seismic level disturbances on the evaluation of precision inertial components. Author (GRA)

N73-15687# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NAVIGATIONAL RELIABILITY USING A NAVIGATIONAL DIGITAL COMPUTER
V. A. Prokofev 22 Sep. 1972 13 p refs Transl. into ENGLISH from Tr. Tsentr. Nauchn. 131, 1970 p 25-29
(AD-750990; FTD-HT-23-1255-72) Avail: NTIS CSCL 17/7

Requirements imposed on the reliability of navigational digital computers are discussed. Author (GRA)

N73-15688# Boeing Co., Seattle, Wash. Commercial Airplane Group.
STUDY AND CONCEPT FORMULATION OF A FOURTH-GENERATION AIR TRAFFIC CONTROL SYSTEM. VOLUME 1: STUDY REPORT Final Report
Apr. 1972 222 p refs 5 Vol.
(Contract DOT-TSC-145; DOT-TSC-306)
(PB-212178; D6-26058-1) Avail: NTIS HC $3.00 CSCL 17G

The operational concept, projected passenger demand, ATC system performance tradeoff data, and subsystem technological alternatives were evaluated to select the two most promising candidate systems for a fourth-generation (1995) ATC system. These two candidates and the upgraded third-generation system were then compared and a final recommended fourth-generation ATC system selected. The recommended system was described as to technology, operation, implementation plan, and required research and development. Author (GRA)

N73-15689# Boeing Co., Seattle, Wash. Commercial Airplane Group.
STUDY AND CONCEPT FORMULATION OF A FOURTH-GENERATION AIR TRAFFIC CONTROL SYSTEM. VOLUME 2: TECHNOLOGICAL ALTERNATIVES Final Report
Apr. 1972 492 p refs 5 Vol.
(Contracts DOT-TSC-145; DOT-TSC-306)
(PB-212179; D6-26058-2) Avail: NTIS HC $6.00 CSCL 17G

The document presents the results of studies of alternative subsystem approaches applicable to the Fourth Generation Air Traffic Control System. Equipment currently in operation, that planned for near future implementation, and various techniques proposed as possible future solutions to ATC requirements are included. Numerous ground-based and satellite-borne systems are discussed for providing the required navigation, surveillance, and communications functions. In addition the ground-based data processing and control equipment along with the required airborne equipment are treated. Author (GRA)

N73-15690# Boeing Co., Seattle, Wash. Commercial Airplane Group.
STUDY AND CONCEPT FORMULATION OF A FOURTH-GENERATION AIR TRAFFIC CONTROL SYSTEM. VOLUME 3: DEMAND AND TRADE STUDY Final Report
Apr. 1972 355 p refs
(Contracts DOT-TSC-145; DOT-TSC-306)
(PB-212180; D6-26058-3) Avail: NTIS HC $6.00 CSCL 17G

Techniques and resulting data are developed in the areas of demand, data acquisition, traffic management, and communications. Each area is subdivided to reflect the geographical region of operation as oceanic, domestic enroute, terminal area, and airport. ATC performance tradeoff information is developed parametrically to encompass a wide range of possibilities for the 1995 time period. Data are presented for STOL, CTOL, and SST/CTOL airplane mix configurations. Separation criteria to meet potential demands, resulting impact on safety, and required improvements for surveillance, navigation, procedure, and communications are included. The effect of airport and runway splits are discussed and parallel runway separation requirements are analyzed. Various mixes of voice and digital communications are considered. Principal computer models used in this study are discussed. Author (GRA)

N73-15691# Boeing Co., Seattle, Wash. Commercial Airplane Group.
STUDY AND CONCEPT FORMULATION OF A FOURTH-GENERATION AIR TRAFFIC CONTROL SYSTEM. VOLUME 4: SYSTEM SELECTION Final Report
Apr. 1972 354 p refs 5 Vol.
(Contracts DOT-TSC-145; DOT-TSC-306)
(PB-212181; D6-26058-4) Avail: NTIS HC $6.00 CSCL 17G

The volume describes the methodology used in selecting a fourth generation Air Traffic Control System consistent with U.S. air transportation needs in 1995, and provides a summary of the results. It includes the derivation and use of the computerized evaluation model, including the computer program for it's implementation, the cost model and supporting cost data, implementation plans, the initial and final system selection processes and results, and recommendations for further study. Author (GRA)

N73-15692# Boeing Co., Seattle, Wash. Commercial Airplane Group.
STUDY AND CONCEPT FORMULATION OF A FOURTH-GENERATION AIR TRAFFIC CONTROL SYSTEM. VOLUME 5: RECOMMENDED RESEARCH AND DEVELOPMENT Final Report
Apr. 1972 187 p refs 5 Vol.
(Contracts DOT-TSC-145; DOT-TSC-306)
(PB-212182; D6-26058-5) Avail: NTIS HC $3.00 CSCL 17G

Research and development needed to support the fourth-generation ATC system implementation is described. A methodology and program plan for operational concept evaluation, a requirements plan for a surface guidance system, and a testing and evaluation schedule for subsystem technical feasibility are described. The impact of future developments on subsystem changes and overall system characteristics is described. Finally, the time phasing of system implementation is also discussed together with the basic criteria used in ATC implementation planning. Author (GRA)

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

N73-15693*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EMERGING NEEDS FOR MOBILE NUCLEAR POWER-PLANTS
John L. Anderson 1972 39 p refs Presented at Winter Meeting of the Am. Nucl. Soc., Washington, 12-17 Nov. 1972
(NASA-TM-X-68164; E-7224) Avail: NTIS HC $4.00 CSCL 18E

Incentives for broadening the present role of civilian nuclear power to include mobile nuclear power plants that are compact, lightweight, and safe are examined. Specifically discussed is the growing importance of: (1) a new international cargo transportation capability, and (2) the capability for development of resources in previously remote regions of the earth including the oceans and the Arctic. This report surveys present and potential systems (vehicles, remote stations, and machines) that would both provide these capabilities and require enough power to justify using mobile nuclear reactor power plants. Author

N73-15694# Los Alamos Scientific Lab., N.Mex.
DATA SHEETS FOR PMC RADIOISOTOPIC FUEL
T. K. Keenan, R. A. Kent, and R. N. R. Mulford Jun. 1972 8 p refs
(Contract W-7405-eng-36)
(LA-4976) Avail: NTIS

PMC is the acronym for Plutonia Molybdenum Cermet. Plutonia, PuO2, forms the ceramic phase of the cermet and conditions approximately 80 atom Pu-238. Molybdenum is the metallic phase of the cermet. The thermal energy resulting from the radiactive decay of the Pu-238 isotope is converted into usable electrical power for space probe or other applications. The basic cermet module is a disk 2.145 in. dia and 0.212 in. thick. The ceramic phase is nominally 83 wt % with the molybdenum contributing the balance of the weight. Stacks of disks are encapsulated in suitable containers to form the working heat source. The characteristics of this cermet are listed with primary emphasis placed on proposed operational conditions and environments. Author (NSA)

N73-15695# Los Alamos Scientific Lab., N.Mex.
NUCLEAR SAFETY OF AN AIRBORNE FAST REACTOR. REACTOR CRITICALITY ANALYSIS PROGRAM Final Report
J. C. Vigil, B. M. Carmichael, and G. H. Best Jun. 1972 5 p refs
(Contract W-7405-eng-36)
(LA-4977) Avail: NTIS

Neutronic calculations were performed for an airborne fast reactor concept in order to evaluate safety aspects of compactions and coolant voiding. The reactor will remain subcritical under severe compactions provided that; (1) all the control elements are inserted prior to compaction; (2) the control material uses B-10 rather than natural boron; and (3) the excess reactivity at the beginning-of-life is less than 6.8%. Voiding of the metal coolant produces only a small reactivity effect. Author (NSA)

N73-15696# Oak Ridge National Lab., Tenn.
RADIATION AND ANNEALING STUDIES ON OXYGEN DOPED AND LITHIUM DIFFUSED GERMANIUM
J. W. Cleland Jul. 1972 23 p refs Presented at the Ann. Conf. on Nucl. and Space Radiation Effects, Seattle, 24 Jul. 1972
(Conf-720707-7) Avail: NTIS

Hall-coefficient resistivity measurements were used to determine the apparent carrier concentration and mobility of n-type Ge doped with specific impurities, or grown to contain oxygen, and then altered by annealing, Co-60 photon irradiation, or Li diffusion. Annealing at 350 C increased the donor concentration and decreased the mobility of oxygen-doped Ge as a consequence of oxygen clustering. Subsequent annealing at 500 C decreased

the donor concentration and increased the mobility as a consequence of oxygen dissociation. Clustering and dissociation were repeated many times with no apparent alteration of total oxygen content. The apparent rate of introduction of lattice defects by Co-60 photons was essentially independent of oxygen concentration in Ge. Author (NSA)

N73-15697# Sandia Labs., Albuquerque, N.Mex.
IONOSPHERE MODIFICATION OF THE ELECTROMAGNETIC PULSE FROM NUCLEAR EXPLOSIONS
R. D. Jones and D. Z. Ring Jul. 1972 30 p refs
(SC-RR-720400) Avail: NTIS

Dispersive effects of the ionosphere impose constraints on satellite electromagnetic pulse (EMP) sensors for nuclear-explosion detection. Dispersion is more effective than absorption in reducing the EMP hazard to soft low-altitude satellites. An estimate of the EMP in the time domain is obtained by convolving a truncated Fourier series approximation of the source signal with the impulse response function of the ionosphere. Author (NSA)

N73-15698# Philippine Atomic Energy Commission, Manila.
NUCLEAR ENERGY IN THE PHILIPPINES: AN ANNOTATED BIBLIOGRAPHY
Dec. 1971 31 p refs
(PAEC(A)-7116-Suppl-4) Avail: AEC Depository Libraries

Seventy-seven references are included and arranged alphabetically by titles under their respective subject heading together with their bibliographic data. A brief annotation or a summary of the article is included. An author index is provided. Subject headings include: chemistry, geology and mineralogy, health physics, instrumentation, isotope technology, life sciences, physics, reactor technology, and general and miscellaneous. NSA

N73-15699# European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.
HYDROGEN AS AN ENERGY VECTOR: NEW FUTURE PROSPECTS FOR APPLICATIONS OF NUCLEAR ENERGY
G. Beghi May 1972 20 p refs
(EUR-4838) Avail: AEC Depository Libraries

In view of a wider penetration of nuclear energy in the energy field and therefore of a diversification of its applications, the usefulness of an intermediary energy vector is pointed out. Therefore hydrogen is examined as to its present potential uses in the future. Among the hydrogen production processes, the method of dissociation of water with a closed cycle of chemical reactions and utilizing nuclear heat seems particularly promising. Author (NSA)

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics, 20 Meteorology; and 29 Space Radiation.

N73-15700*# Missouri Univ., Kansas City. Optical Physics Lab.
REFLECTANCE OF AQUEOUS SOLUTIONS Final Report
Marvin R. Querry 21 Jul. 1972 176 p refs Submitted for publication
(Grant NGR-25-001-012)
(NASA-CR-130136; UMKC-2140-2228) Avail: NTIS HC $11.00 CSCL 20F

The optical properties and optical constants of water and aqueous solutions were studied to develop an accurate tabulation of graphical representations of the optical constants through a broad spectrum. Manuscripts of articles are presented concerning extinction coefficients, relative specular reflectance, and temperature effect on the water spectrum. Graphs of absolute reflectance, phase shifts, index of refraction, and extinction coefficients for water, heavy water and aqueous solutions are included. F.O.S.

N73-15701# Technische Hogeschool, Delft (Netherlands). Lab. voor Aero- en Hydrodynamica.
SOME REMARKS ON THE RHEOLOGICAL MODEL OF JEFFREYS, OLDROYD AND BIRD
H. J. Merk Oct. 1972 33 p refs
(WTHD-42) Avail: NTIS HC $3.75

The rheology for non-Newtonian fluids is discussed. From statistical calculations made by Bird, Warner and Evans for dilute suspensions of rigid dumbbells with Brownian motion in Newtonian solvent, Bird, derived a modification of this model, called here the model of Jeffreys, Oldroyd and Bird (JOB). On the base of their kinetic calculations, relations were derived between the coefficients occurring in the constitutive equations of the JOB model. It is shown that some of these relations can be derived from a simple qualitative reasoning concerning the material functions for small-amplitude oscillatory shear flows. This means that the relations involved may be generalized for fluids not necessarily dilute suspensions of rigid dumbbells, and their derivation does not have to be based on complicated statistical calculations. Author

N73-15702# Meteorological Office (Gt. Brit.).
HYDROMAGNETIC WAVES ON A BETA-PLANE: A NUMERICAL STUDY OF THE DISPERSION RELATIONSHIP
R. Hide and M. V. Jones 1972 21 p refs
(MET-O-857; Sci-Paper-33) Avail: NTIS HC $3.25; HMSO 31 1/2p; PHI $1.45

The need for a thorough understanding of effects produced by Coriolis forces on hydromagnetic waves in a bounded fluid arises in various theoretical studies of rotating magnetic astronomical bodies (notably the Earth, Jupiter, the Sun, and certain stars, including pulsars). Recently an exact theoretical analysis of slow waves in a thin rotating spherical shell of an incompressible fluid pervaded by a uniform magnetic field directed (in its undisturbed state) parallel to latitude circles was made. An approximate dispersion relationship derived on the basis of a simple physical model is given which agrees satisfactorily with the exact analysis. This makes it possible to exploit with some confidence the explicit nature of the dispersion relationship and rendering a numerical analysis of the relationship worthwhile. Author

N73-15703# National Aeronautical Lab., Bangalore (India).
APPLICATION OF X-RAY AND ELECTRON SPECTROSCOPY TO MATERIALS SCIENCE
S. Ramaseshan and T. G. Ramesh Jan. 1971 17 p refs
(NAL-SR-1) Avail: NTIS HC $3.00

The basic principles underlying X-ray emission, Auger effect and X-ray absorption are reviewed. Experimental methods of obtaining the binding energy by the spectroscopy of ejected electrons (ESCA) are presented. The alteration in energy levels due to covalent and ionic bonding is next discussed. Chemical shifts observed and their uses in the study of bonding, coordination, electro negativity, oxidation states and organic structure analysis are dealt with briefly with examples. The paper finally deals with the important application of X-ray spectroscopy in the study of band structure of materials and how the energy gaps can be measured. The theory of extended X-ray fine structure is briefly touched upon. Author

N73-15704# Research Inst. of National Defence, Stockholm (Sweden).
A RAPID HEAT CAMERA WITH STAR SHAPED SCANNING ROTOR
Per Lindberg and Bengt Mattsson Jun. 1971 22 p refs In SWEDISH
(FOA-2-A-2540-52) Avail: NTIS HC $3.25

A heat camera with a field of view of 3 deg times 2 deg has been constructed and tested, wherein the picture searching process is performed by an IR detector and a fast rotating star shaped mirror drum, which consists of 12 cornered pairs of mirrors (right angle mirrors). Nearly 15000 linear saw tooth sweeps per second can be achieved although 1000 to 2000 lines per second appear to be the optimal. The heat camera has been tested with InSb-and GeHg detectors and pictures rich in detail have been obtained; for example, small boats at some kilometers distance. The mirror rotor accomplishes higher search rates than can normally be exploited. Author

N73-15705*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROPAGATION OF WAVES OF ACOUSTIC FREQUENCIES

IN CURVED DUCTS
Wojciech Rostafinski Washington Jan. 1973 13 p refs
(NASA-TM-X-2698; E-7207) Avail: NTIS HC $3.00 CSCL 20A

The propagation of waves of acoustic frequencies in curved ducts is studied for the first four modes. The analysis makes use of Bessel functions to construct curves of wave number in the duct versus imposed wave number. The results apply to ducts of arbitrary width and arbitrary radii of curvature. The characteristics of motion in a bend are compared with propagation of waves in a straight duct, and important differences in the behavior of waves are noted. Author

N73-15706*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PHYSICS IN PERSPECTIVE. VOLUME 2, PART A: THE CORE SUBFIELDS OF PHYSICS
1972 760 p refs
(Contract NSR-09-012-090)
(NASA-CR-130361) Avail: NTIS HC $40.00, NAS-NRC 2101 Constitution Ave., Washington, D. C. 20418

Panel reports to the Survey Committee are presented to provide detailed technical background and documentation for committee findings, and to indicate the vitality and strength of the subfields of physics. Included are the core subfields of acoustics, optics, condensed matter, plasmas and fluids, atomic molecular and electron physics, nuclear physics, and elementary particle physics. F.O.S.

N73-15707*# Techtran Corp., Silver Spring, Md.
ENVIRONMENTAL NOISE POLLUTION CAUSED BY JET AIRCRAFT TRAFFIC
N. G. Zimmermann Washington NASA Jan. 1972 26 p refs Transl. into ENGLISH of "Laermbelaestigung der Umwelt Durch den strahlflugverkehr" Max-Planck-Inst. fuer Stroemungsforsch., Goettingen, West Germany, 1971 27 p Presented at 4th DGLR Ann. Meeting, Baden-Baden, West Germany, 11-13 Oct. 1972
(Contract NASw-2485)
(NASA-TT-F-14655) Avail: NTIS HC $3.50

A survey is presented of commercial jet aircraft noise problems and possible ways to minimize these in the vicinity of airports. Acoustic measurements, such as perceived noise level are discussed, and the Q-formula for analyzing acoustic properties is presented. Possible methods of noise reduction are shown. The noise situation in the vicinity of airports is investigated with emphasis on noise abatement profiles to reduce annoyance. Author

N73-15708*# Boeing Co., Seattle, Wash. Commercial Airplane Group.
JET ENGINE NOISE SOURCE AND NOISE FOOTPRINT COMPUTER PROGRAMS
D. G. Dunn, N. A. Peart, D. L. Miller, and K. C. Crowley Oct. 1972 148 p refs
(Contract NAS2-6969)
(NASA-CR-114517; D6-60169) Avail: NTIS HC $9.50 CSCL 20A

Calculation procedures are presented for predicting maximum passby noise levels and contours (footprints) of conventional jet aircraft with or without noise suppression devices. The procedures have been computerized and a user's guide is presented for the computer programs to be used in predicting the noise characteristics during aircraft takeoffs, fly-over, and/or landing operations. Author

N73-15709*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SOME EFFECTS OF WING PLANFORM ON SONIC BOOM
Lynn W. Hunton, Raymond M. Hicks, and Joel P. Mendoza Washington Jan. 1973 39 p refs
(NASA-TN-D-7160; A-4491) Avail: NTIS HC $3.00 CSCL 01B

A wind-tunnel investigation was conducted to determine the effect of wing planform on sonic boom at Mach numbers of 1.7, 2.0, and 2.7. The results of the investigation show that the wing leading-edge sweep is one of the primary planform variables affecting the overpressure characteristics. Author

N73-15710# SACLANT ASW Research Center, La Spezia (Italy).
ACOUSTIC SCATTERING BY OBJECTS WHOSE SHAPES PERMIT SEPARATION OF VARIABLES
Vetle R. Lauvestad 1 Sep. 1972 35 p refs
(AD-750754; SACLANTCEN-TM-180) Avail: NTIS CSCL 20/1

Descriptions of the field scattered by finite objects in the presence of a radiating acoustic source are among the investigations fundamental to antisubmarine warfare, but progress from idealised tractable models to more realistic target shapes is a slow business of great theoretical difficulty, leaving aside the complications introduced by the properties of the medium. In this paper a selective review of existing treatments is first briefly and critically made. Then, because of the insight that generalisations may give, a general treatment is formulated of the acoustic scattering problem that includes the whole class of cases in which Helmoltz's equation separates and partial wave analysis is applicable. Care is taken to indicate the practical shortcomings of the class of solutions that this exact treatment provides. Possible means by which some of these shortcomings might be overcome are indicated. Author (GRA)

N73-15711# Airborne Instruments Lab., Deer Park, N.Y.
A 10/6 MICROMETER DETECTOR ARRAY Quarterly Report, 1 Apr. - 1 Jul. 1972
R. Lange, A. Dinardo, R. Augeri, and D. Yustein Oct. 1972 39 p refs
(Contract N00014-72-C-0446; ARPA Order 1806)
(AD-750402; AIL-0123-I-1; QR-1) Avail: NTIS CSCL 17/5

An optical design approach is presented with supporting optical field patterns calculated on a digital computer for a 10 x 10 element array of PV-HgCdTe elements operating in the heterodyne mixing mode at 10.6 micrometers. Mixed field patterns across the surface of the detector were calculated along with the far field diffraction pattern of the array showing the signal crossover levels between adjacent elements of the array. Also discussed is an analysis of the power dissipation requirements of the photovoltaic mixers at 77 K. The local oscillator heating proved to be the highest with about 2 milliwatts dissipation required for near quantum noise limited operation at 1500 MHz. For a narrower bandwidth system of 150 MHz, the local power dissipation requirement may be reduced to several tenths of a milliwatt with the photodiode leakage current becoming the predominant power dissipating element. Author (GRA)

N73-15712# Harry Diamond Labs., Washington, D.C.
A NEW EMPHASIS ON THE USE OF EXCITED STATE G FACTORS FOR THE INTERPRETATION OF IMPURITY-ION SPECTRA
S. M. Kulpa and N. Karayianis 1972 16 p refs
(AD-750343) Avail: NTIS CSCL 07/4

It has been shown that the partial g-sum rule can be a useful tool for the interpretation of impurity-ion optical spectra. Several theoretical and experimental results have been discussed wherein the accuracy of the sum rule is illustrated. Recent optical Zeeman studies of triply-ionized neodymium and erbium have been compared with theoretical predictions. Discussion has shown how some of the difficulties of optical Zeeman spectroscopy may be circumvented through the use of special, excited-state EPR techniques. A double resonance system has been described with which experiments are presently being conducted on the new laser host, LiYF4. GRA

N73-15713# Texas Univ., Austin. Electronics Research Center.
OPTICAL BIREFRINGENCE MEASUREMENT BY MEANS OF A ROTATING ANALYZER WITH APPLICATION TO KERR EFFECT
G. B. Thurston and R. S. Wilkinson 15 Mar. 1972 34 p refs
(Contract F44620-71-C-0091; AF Proj. 4751)
(AD-750545; TR-122; AFOSR-72-0732TR) Avail: NTIS CSCL 20/6

A rotating analyzer method was developed for rapid measurement of the ellipticity of polarized light as produced by optically birefringent materials. A plane optical analyzer, in the form of a Glann-Thompson prism, is placed in the light path ahead of an electrical photodetector and is continuously rotated on an axis coincident with the light path. For light having either constant or slowly varying ellipticity, this lead to sinusoidally

time varying electrical signals which bear a simple relationship to the eccentricity and orientation of the ellipticity. In application to the Kerr effect, the ellipticity results from passage of circularly polarized light through the Kerr cell. For sinusoidally time varying electric fields applied to the Kerr cell, the optical retardation of the cell contains both steady and alternating components. These components are separated in the frequency structure of the electrical photoresponse. In this application the method may be used to discriminate against effects of light intensity fluctuations and small residual birefringence in windows. This permits measurement of the Kerr effect in materials having very small Kerr constants. Author (GRA)

N73-15714# Harry Diamond Labs., Washington, D.C.
SCATTERING OF AN ELECTROMAGNETIC PULSE (EMP) BY APERTURES IN METAL STRUCTURES
Werner J. Stark 1972 16 p refs
(AD-750381) Avail: NTIS CSCL 20/14

Previous work was done on the penetration of EMP through apertures, include the investigation of the problem for specific geometries. The case examined in the present study is that of diffraction by a rectangular aperture in a structure. Suzuki applied the variational method for a rectangular aperture in an infinite plane to compute the transmission coefficient. The author also derived an approximate expression for the transmission coefficient for a long and narrow slot and was able to show excellent agreement with calculations using the variational method. The experimental method and theoretical analysis described in this report shows how Suzuki's analysis can be applied to estimate the EMP within a structure resulting from penetrations through rectangular apertures. GRA

N73-15715# Aerospace Corp., El Segundo, Calif. Space Physics Lab.
APPROXIMATE SECOND INVARIANT FOR A DIPOLE FIELD
Michael Schulz 15 Sep. 1972 21 p refs
(Contract F04701-72-C-0073)
(AD-750860; TR-0073(3260-20)-2; SAMSO-TR-72-233) Avail: NTIS CSCL 04/1

Mathematically self-consistent analytical approximations to the second invariant and drift frequency in terms of pitch angle and energy are deduced from an existing analytical approximation to the bounce period of a charged particle trapped in the field of a magnetic dipole. The numerical accuracy of the resulting expressions is significantly better than that of the approximations to these functions customarily found in the literature. The results are potentially of interest in simplifying the theories of bimodal diffusion and other dynamical phenomena in the magnetosphere. Author (GRA)

N73-15716# Army Edgewood Arsenal, Md. Directorate of Development and Engineering.
A LIGHT SCATTERING TECHNIQUE FOR STUDYING BROWNIAN MOTION Final Technical Report, Sep. 1970 - May 1971
Merrill E. Milham Sep. 1972 33 p refs
(DA Proj. 1B5-62602-A-081)
(AD-750110; EA-TR-4660) Avail: NTIS CSCL 20/6

The purpose of the work was to study the light scattered from a simple statistical medium that consisted of a monodispersed ensemble of spherical, Brownian particles. The light from a helium-neon laser operating at a wavelength of 632.8 nm was scattered from a dilute water suspension of the particles, which are polystyrene spheres of diameter 0.557 micrometers. The spectrum of the scattered light is a very narrow Lorentzian whose half width at half height is related to the diffusion constant of the particles. An experiment that employs the technique of pulse interval analysis to analyze the scattered light spectrum is described in detail. The results of this experiment yielded a spectral linewidth that is caused not only by the diffusive motion, but also by the convective motion of the particles. GRA

N73-15717# California Univ., Los Angeles. School of Engineering and Applied Science.
ON THE SCATTERING OF WAVES BY PENETRABLE OBJECTS Semiannual Report, 1 Feb. - 1 Sep. 1972
C. Yeh Sep. 1972 8 p
(Contract N00014-69-A-0200-4026)
(AD-750766; UCLA-ENG-7286) Avail: NTIS CSCL 20/1

The document is a semiannual progress report on the research activities in scattering of waves by penetrable objects. Progress on the following two problems is reported: (1) Solid lenses and (2) Microsound Elastic waveguides. Author (GRA)

N73-15718# Princeton Univ., N.J.
THE PRINCETON PENNSYLVANIA ARMY AVIONICS RESEARCH PROGRAM. A FUNDAMENTAL STUDY OF STATIC ELECTRIC PHENOMENA (APPLIED TO HELICOPTERS) Final Task Report, 1 Sep. 1966 - 30 Dec. 1971
G. J. Born, W. F. Burke, and E. J. Durbin Mar. 1972 78 p refs
(Contract DA-28-043-AMC-02412(E); DA Proj. 1H1-62202-A-219)
(AD-750617; ECOM-02412-10) Avail: NTIS CSCL 20/3

In the report is given a summary of the charging and discharging processes of a helicopter in flight. Emphasis is placed upon obtaining approximations for estimating the magnitude of the problem for given environmental conditions. The problems of electrostatic charging and discharging of helicopters with regard to safety of personnel, cargo and radio frequency interference are stated. Acceptable safety limits for personnel protection and safe cargo handling are presented. A solution to the cargo hook up problems of electrostatic charged helicopters is proposed, using current technology. A summary is given of the construction and test results of this safe-cargo hook up system. The Appendixes summarizes work on corona discharges, space charges, and environmental effects on charging and discharging phenomena. Author (GRA)

N73-15719# Naval Training Equipment Center, Orlando, Fla.
ANALYSIS OF UNDERWATER ACOUSTIC PROPAGATION LOSS MATH MODELS IN CURRENT TRAINING DEVICES Final Report
E. F. Meyer Aug. 1972 46 p refs
(AD-750694; NAVTRAEQUIPCEN-IH-200) Avail: NTIS CSCL 05/9

The report analyzes and compares the various simulation designs and math models of underwater acoustic simulation presently being used in current training devices developed by the Naval Training Device Center. The analysis contains model simplifications and their affects on acoustic propagation loss. The results of these models are compared with the results of the ray trace model developed by the Naval Air Development Center. Author (GRA)

N73-15720# Technische Hochschule, Darmstadt (West Germany). Lehrstuhl fuer Angewandte Physik.
SPARK LIGHT PULSES OF EXTREMELY SHORT DURATION Final Scientific Report, 1 Feb. 1968 - 31 Jan. 1972
Heinz Fischer Jul. 1972 24 p refs
(Contract F61052-68-C-0039; AF Proj. 8679)
(AD-750788; AFCRL-72-0537) Avail: NTIS CSCL 20/6

Nanolites, spark channels that produce intense light flashes of very short duration, were investigated to obtain a physical understanding of how their characteristics could be adjusted. After designing a spark circuit that gave maximum current rise, a set of nanolites of different capacities were constructed to stand the various steps of the spark breakdown. The high resistance prechannel was found to be transparent and subnanosecond light pulses produced by such prechannels closely followed the shape of the current pulse. Author (GRA)

N73-15721# Brandeis Univ., Waltham, Mass. Dept. of Physics.
AERODYNAMICS OF GASES AND INTERACTION WITH RADIATION Final Technical Report, 1 Nov. 1967 - 14 Feb. 1972
Eugene P. Gross Oct. 1972 14 p refs
(Grant AF-AFOSR-1370-68; AF Proj. 9767)
(AD-750482; AFOSR-72-1976TR) Avail: NTIS CSCL 20/10

A very brief discussion is given of research in the following fields: Analytical methods in nonrelativistic field theory; point transforms in the quantum many body problem; singular perturbation theory in kinetic theory; light scattering from gases; variational principles in kinetic theory; solution of the Liouville equation; moment method in kinetic theory. Author (GRA)

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N73-15722*# Science Applications, Inc., La Jolla, Calif.
ELECTRON TRANSPORT AND SPACE SHIELDING HANDBOOK Final Report
D. C. Shreve and J. A. Lonergan 14 Nov. 1971 253 p refs
(Contract NAS8-26753)
(NASA-CR-123998; SAI-71-559-LJ) Avail: NTIS HC $14.75 CSCL 20H

The transport of electrons through material is discussed with emphasis on space radiation problems. Brief reviews of the electron radiation environment and electron transport properties are presented. Parametric representations of the electron transmitted fraction, energy spectrum, angular distribution, backscatter coefficient, and energy deposition are given as functions of electron energy and target material. Parametric equations for thick target bremsstrahlung are presented. Calculations of the transport of isotropically incident electrons relevant to space applications are shown. Comparisons of parametric representation with data, photon attenuation coefficients, electron energy deposition data, flux-to-dose conversion relations, and formalism applicable to space shielding problems are presented. Author

N73-15723*# Advanced Technology Center, Inc., Dallas, Tex.
MEASUREMENTS OF ELECTRON-BREMSSTRAHLUNG COINCIDENCE RATES AT INTERMEDIATE ELECTRON ENERGIES Final Report, 1 Nov. 1971 - 1 Nov. 1972
D. H. Rester Oct. 1972 34 p refs
(Contract NAS8-27866)
(NASA-CR-124007; B-94200/2CR-55) Avail: NTIS HC $3.75 CSCL 20H

Coincidence rates have been measured for inelastically scattered electrons and their associated bremsstrahlung for bombarding energies of 0.20 and 0.15 MeV. Measurements were made for an electron angle of 45 deg and a photon angle of 20 deg. Inelastic electron energies of 0.15 and 0.16 MeV were considered for an incident energy of 0.2 MeV and an inelastic electron energy of 0.12 MeV was considered for an incident energy of 0.15 MeV. To observe the trend with atomic number, Al and Au targets were used. The experimental cross section differentials in photon and electron angles and energy were found to be smaller than the predictions of the Bethe-Heitler theory. Author

N73-15724# Electrotechnical Lab., Tokyo (Japan).
EXTENDED APPLICATIONS AND IMPROVEMENT OF THE 4-PI BETA-GAMMA COINCIDENCE METHOD IN THE STANDARDIZATION OF RADIONUCLIDES
Yasushi Kawada Jul. 1972 101 p refs
(RR-730) Avail: NTIS HC $7.25

The improvement and extended applications of the 4 pi beta-gamma coincidence method are studied for the standardization of radionuclides. The corrections are interpreted, such as the accidental coincidences and the response of the beta counter to gamma rays and internal conversion electrons. A technique is presented which enables precise measurements of the sensitivity of the 4 pi beta gas proportional counter to gamma rays and conversion electrons. The method offers an improvement in counting statistics in addition to a considerable reduction of the error due to spurious pulses, noise, radioactive contaminants, and background fluctuations. Author

N73-15725# Pisa Univ. (Italy). School of Engineering.
THE PROPOSAL OF A METHOD FOR THE DETERMINATION, BY MEANS OF A GAS SCINTILLATION DETECTOR, OF THE FLUORESCENCE OF RADIUM-226 COATED WITH RADON-222 FOR USE AS A SOURCE IN INDUSTRY, RADIOLOGY, AND RESEARCH [PROPOSTA DI UN METODO PER LA DETERMINAZIONE, MEDIANTE UN RIVELATORE A SCINTILLAZIONE A GAS, DELLA FUORIUSCITA DI RADON-222 DA SORGENTI SIGILLATE DI RADIO-226 PER USI INDUSTRIAL, RADIOLOGICI E DI RICERCA]
G. Curzio 1972 20 p refs In ITALIAN *Its* Ser. 29a
(Publ-1410) Avail: NTIS HC $3.00

The emission phenomenon of a radiation source consisting of radium-226 sealed with radon-222 is described in terms of detecting the possibility of sudden loss of the source, and the resulting damages and contamination. Brief examinations of the methods generally used for measuring the fluorescence of radon are presented, and the characteristics that an ideal instrument for measuring the fluorescence are described including the noninterference of the instrument with the phenomenon being examined, and the capability to discriminate between the alpha emitted from the radon and the gamma emitted by the source. The scheme for the proposed gas scintillation detector for measuring the intensity of fluorescence of radon with the source of radium is presented. Transl. by F.O.S.

N73-15726# Maryland Univ., College Park. Center for Theoretical Physics.
LIGHT CONES VERSUS NONLIGHT CONE CONTRIBUTIONS TO STRUCTURE FUNCTIONS IN THE BJORKEN LIMIT
D. Bhaumik and O. W. Greenberg Dec. 1972 19 p refs
(Grant NSF GP-8748)
(TR-73-076) Avail: NTIS HC $3.00

A specific form of the Bjorken limit of structure functions with x-space singularities is considered for a squared > 0 and for a squared = 0, as point functions and as distributions. It is determined how contributions to such examples of the structure function, in the scaling limit, depend on the strength of the singularity on x squared = a squared > 0 or x squared = 0, and on the rate of decrease or increase of the coefficient of the singularity. Author

N73-15727# Maryland Univ., College Park. Center for Theoretical Physics.
CALLAN-SYMANZIK EQUATIONS AND EPSILON-EXPANSIONS
P. K. Mitter Dec. 1972 42 p refs
(Grant NSF GP-32418)
(TR-73-020) Avail: NTIS HC $4.25

A noncanonically renormalized phi to the 4th power theory in 4-epsilon dimensions with the aid of normal product methods is analyzed. By a systematic use of Callan-Symanzik equations it is shown how a critical point can be determined and the anomalous scale dimensions of all composite operators obtained by using Wilson's epsilon-expansion. These methods are also applied to the coefficient distributions appearing in operator product expansions. Author

N73-15728# Maryland Univ., College Park. Center for Theoretical Physics.
OFF-SHELL FORM FACTORS FOR COMPOSITE HADRONS AND EXCLUSIVE PROCESSES IN ELECTROPRODUCTION
J. Sucher and C. H. Woo Dec. 1972 24 p refs Presented at the 1972 Intern. Conf. on High Energy Phys., Batavia, Ill.
(Grant NSF GP-32418)
(TR-73-070) Avail: NTIS HC $3.25

The off-shell asymptotic behavior of electromagnetic form factors of a composite particle are studied within the context of Bethe-Salpeter ladder models for the bound state. It is found that the form factors still vanish when one leg is off-shell, though less rapidly than when both legs are on-shell. The implication of this for electroproduction exclusive cross-sections is discussed. Author

N73-15729*# Techtran Corp., Glen Burnie, Md.
ADDITION REACTIONS WITH H- AND O-ATOMS AT LOW TEMPERATURES
K. H. Geib and P. Harteck Washington NASA Jan. 1973 17 p refs Transl. into ENGLISH from Ber. Deut. Chem. Ges. (Heidelberg), v. 66B 1933 p 1815-1825
(Contract NASw-2037)
(NASA-TT-F-14643) Avail: NTIS HC $3.00 CSCL 20H

Addition reactions are inhibited by creation of a stable compound from another stable compound by increasing the valence of an atom. Preferential addition occurs at low tempera-

tures in compounds in which a secondary valence is created chemically. The familiar final compounds are obtained only through rearrangement of these unstable intermediate compounds.
Author

N73-15730# Oak Ridge National Lab., Tenn.
ENVIRONMENTS AND ISOTOPES
Helen P. Raaen Jul. 1972 118 p refs
(Contract W-7405-eng-26)
(ORNL-IIC-39) Avail: NTIS

The past significance and potential usefulness of isotopes to study, monitor, and control the environments, both terrestrial and extraterrestrial are discussed. Examples show how isotopes are increasing the understanding of the properties, processes, and composition of these systems and how they are revealing the subtle interactions among them. The contributions of isotopes to man's successful invasion and continuing exploration of extraterrestrial environments are reviewed. They include space environment simulation, life detection, life support, determination of environmental properties, and evaluation of effects that result from man's excursions into space. Author (NSA)

N73-15731# California Univ., Livermore. Lawrence Livermore Lab.
SIMULATION AND ANALYSIS OF PARTICLE MOTION IN MAGNETIC MIRRORS WITH HIGH FREQUENCY FLUCTUATIONS
R. E. Aamodt (Colo. Univ.) and J. A. Byers Jul. 1972 17 p refs
(Contract AT(11-1)-2081)
(COO-2181-7) Avail: NTIS

Particle motion in a magnetic mirror containing high-frequency short-wavelength longitudinal electric fields is followed numerically for many mirror bounce periods. It is found that while the magnetic moment undergoes large rapid changes, these fluctuations seldom imply particle loss from the mirror. This behavior is shown to be completely consistent with nonlinear superadiabatic theory, wherein containment properties of trap are affected only when particles cross isolated singular surfaces in phase space.
Author (NSA)

N73-15732# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE EVOLUTION OF CHARGED PARTICLES FROM A POINT SOURCE IN THE FIELD OF A MAGNETIC DIPOLE
E. K. Kolesnikov and B. V. Filippov 21 Jul. 1972 63 p Transl. into ENGLISH from Vestn. Leningr Univ., Ser. Mat., Mekh. i Astron. (Leningrad), no. 7, 1970 p 88-120
(AD-750703; FTD-MT-24-74-72) Avail: NTIS CSCL 20/9

In the article the spreading of charged particles from a point source in the field of a magnetic dipole is investigated. This work is based on the study of two famous integrals of equations of motion of charged particles in a dipole field. The equatorial injection of electrons and protons is examined. The power structure of forming radiating zone is investigated. The independence of boundaries of this zone on the value of magnetic dipole moment, on the charge, and on the mass of injecting particles is proved. Author (GRA)

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N73-15733# Groupe de Recherches Ionospheriques, Paris (France).
THE POTENTIAL CREATED BY A SINUSOIDALLY VARYING POINT CHARGE IN A COLD, HOMOGENEOUS MAGNETOPLASMA
J. M. Chasseriaux Jun. 1972 30 p ref Transl. into ENGLISH from Ann. Geophys. (France), v. 27, 1971 p 329-337 In ENGLISH and FRENCH
(GRI/TP/109) Avail: NTIS HC $3.50

In the theory of quadripole plasma probes, the knowledge of the potential set up in a magnetoplasma by a sinusoidally-varying, immobile point charge is of fundamental importance. Here this potential is derived for a cold, homogeneous, and boundless magnetoplasma, in the general case where the coefficients of the permittivity tensor are complex. In particular, its phase is studied in the case where collisions are negligible.
Author

N73-15734# Research Inst. of National Defence, Stockholm (Sweden).
PARTICLE KINETICS AND ENERGY BALANCE IN FUSION PLASMAS
Lennart Egardt and Nils Hoernqvist Jun. 1971 20 p refs In SWEDISH
(FOA-4-C-4465-25) Avail: NTIS HC $3.00

The main features of particle production and particle consumption in a stationary fusion plasma are discussed. Results of calculations are presented in diagrams for different initial parameters. The results show that energy release of the order of 10 k ton/kg of fusion material can be expected. Author

N73-15735# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF THE METHOD OF LIQUEFYING THE VAPOR PHASE ON THE FLOW CHARACTERISTICS OF THE ACCELERATOR OUTPUT OF A LIQUID-METAL MHD-CONVERTER
V. B. Kozlov and V. A. Dzhamardzhashvili 5 Jan. 1973 12 p refs Transl. into ENGLISH from Izv. Akad Nauk SSSR, Energ. i Transport, (Moscow), no. 5, 1972 p 90-95
(JPRS-57915) Avail: NTIS HC $3.00

A thermodynamic analysis of several types of accelerators for liquid-metal MHD-converters is presented. Author

N73-15736*# Scientific Translation Service, Santa Barbara, Calif.
LOW FREQUENCY OSCILLATION IN A PENNING DISCHARGE PLASMA UNDER CONDITIONS OF CYCLOTRON ION SOURCE
L. I. Romanyuk and V. M. Slobodyan Washington NASA Jan. 1973 13 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), v. 17, no. 5, May 1972 p 818-824
(Contract NASw-2483)
(NASA-TT-F-14649) Avail: NTIS HC $3.00 CSCL 20I

Low frequency oscillations which develop similar to the low frequency oscillations in a Penning discharge with a hot cathode were investigated in the ion source of the U-120 cyclotron. It was found that for a cyclotron with a working magnetic field intensity, and gas flow rate, there are intense oscillations in a discharge, resulting in almost 100% modulation of the plasma density. It is concluded that oscillations, occuring in the ion source plasma of a cyclotron, have considerable effect on the operation of the ion source, and determine the modulation of the beam extracted from the cyclotron. F.O.S.

N73-15737# Texas Univ., Austin. Center for Plasma Physics and Thermonuclear Research.
TEXAS TURBULENT TORUS EXPERIMENT Progress Report
1 Jul. 1972 97 p refs
(Contract AT(40-1)-4087)
(ORO-4087-8) Avail: NTIS

The general objectives of the experiment are discussed together with the planned experimental program. Detailed descriptions are given of the experimental apparatus along with diagnostic equipment. NSA

N73-15738# Texas Univ., Austin. Center for Plasma Physics and Thermonuclear Research.
PLASMA CONFINEMENT AND TURBULENCE THEORY
W. E. Drummond [1972] 11 p Sponsored by AEC
(ORO-3458-34) Avail: NTIS

Brief discussions of research are given for the following areas: (1) neoclassical transport; (2) dynamic behavior of tokamaks; (3) axisymmetric divertor; (4) microinstabilities in tokamaks, and (5) turbulent heating. NSA

N73-15739# Los Alamos Scientific Lab., N.Mex.
MODEL FOR THE INSTABILITY ABSORPTION IN A LASER HEATED PLASMA
R. C. Mjolsness and H. M. Ruppel Jun. 1972 7 p refs
(Contract W-7405-eng-36)

(LA-4984) Avail: NTIS
A model is presented for the evaluation of the laser flux absorbed by a plasma instability mechanism. The model is suitable for inclusion in hydrodynamic codes. The absorbed flux is proportional to a two parameter function, which is given in phenomenological form. While the theory has been made consistent with existing theoretical information on the behavior of instability absorption, a considerable extrapolation of existing theory is necessary to evaluate the absorbed flux uniquely. Author (NSA)

N73-15740# United Aircraft Corp., East Hartford, Conn. Research Labs.
PRODUCTION OF PLASMAS FOR THERMONUCLEAR RESEARCH BY LASER BEAM IRRADIATION OF SOLID PARTICLES Semiannual Report, 31 Jan. - 31 Jul. 1972
Alan F. Haught, Donald H. Polk, James T. Woo, Walter J. Fader, Richard G. Tomlinson, and Roger A. Haas Jul. 1972 48 p refs
(Contract AT(11-1)-3547)
(COO-3547-2; UARL-L-920365-17) Avail: NTIS
High temperature, high density plasmas produced in vacuum within a magnetic containment field by laser beam irradiation of an isolated, small solid particle are being utilized in a program to examine in detail the high beta capture, transition to mirror confinement, and subsequent decay of a minimum-B, mirror confined plasma in the high density regime. This program is based on and is a direct extension of the production, heating, and magnetic field capture and confinement investigations of laser produced plasmas which have been carried out.
Author (NSA)

N73-15741# New York Univ., N.Y. Courant Inst. of Mathematical Sciences.
ENERGY PRINCIPLE WITH SPECIFIC INDUCTANCE
Glenn Bateman Jul. 1971 47 p refs
(Contract AT(30-1)-1480)
(NYO-1480-182; MF-75) Avail: NTIS
The stability conditions for a scalar pressure, toroidal plasma are formulated by means of an energy variational principle in which the geometric problem of variation of the flux surface shapes is separated from the variation of the flux profile. By means of successive minimizations, holding the surface shapes and the flux profiles fixed, the potential energy is written as a one dimensional integral over a function of pressure, differential flux, and the specific inductance matrix. The latter depends upon only the geometry of the surfaces. Stability conditions are derived by varying the flux profile and the geometry. Exact results for the specific inductance are calculated for straight cylinders, axisymmetric toruses, and helically symmetric configurations, all with arbitrary cross sections. Author (NSA)

N73-15742# Colorado Univ., Boulder. Dept. of Astro-Geophysics.
RADIATION COUPLING OF BERNSTEIN MODES IN DENSE PLASMAS Interim Progress Report
J. Hoffman Jul. 1972 13 p refs
(Contract AT(11-1)-2081)
(COO-2181-10) Avail: NTIS
A theoretical model is used to determine which electromagnetic mode is involved in the coupling process with the Bernstein mode. The characteristics of the electromagnetic mode at the plasma-vacuum boundary are studied. The effects of plasma density are also mentioned. NSA

N73-15743# Oak Ridge National Lab., Tenn.
TOKAMAK TWO-FLUID CODE: EFFECTS OF NEUTRAL BEAM HEATING, RADIATION LOSS, AND CHARGE EXCHANGE
J. T. Hogan and R. A. Dory 1972 4 p refs Presented at 5th European Conf. on Controlled Fusion and Plasma Phys., Grenoble, France, 21 Aug. 1972 Sponsored by AEC
(Conf-720804-2) Avail: NTIS
Requirements for heating a large Tokamak device with energetic neutral beams are considered. Even in a pessimistic treatment one finds that approximately 10 MW of supplemental injected power would produce plasma of true thermonuclear interest. Losses from radiation, plasma thermal conduction, mass transport, ionization, and charge exchange are included.
Author (NSA)

N73-15744# Colorado Univ., Boulder.
NONLINEAR PHENOMENA IN COLLISIONLESS PLASMAS Progress Report, 1 Sep. 1971 - 31 Aug. 1972
Richard E. Aamodt and J. Hoffman 31 Aug. 1972 5 p refs
(Contract AT(11-1)-2081)
(COO-2181-9) Avail: NTIS
The phenomena of neoclassical particle loss rates from mirror machines, and the coupling of radiation into or out of dense plasmas were studied. A brief discussion of this research is presented. NSA

N73-15745# Los Alamos Scientific Lab., N.Mex.
OCCURRENCE OF HIGH-ENERGY ELECTRONS AND SURFACE EXPANSION IN RADIANTLY HEATED TARGET PLASMAS
R. L. Morse and C. W. Nielson Jul. 1972 15 p refs
(Contract W-7405-eng-36)
(LA-4986) Avail: NTIS
It is shown that limitations on collisionless electron thermal conduction place a lower limit on the range of energies of electrons in the surface of target plasmas which are heated by incident electromagnetic radiation, and that in cases of contemporary experimental interest these energies can be hundreds of keV. It is then shown that these high energy electrons can cause a much faster expansion of plasma from the heated surface than would be predicted by a single fluid theory. Numerical simulations demonstrate both effects. Author (NSA)

N73-15746# California Univ., Livermore. Lawrence Livermore Lab.
PLASMA FOCUS-SOLID TARGET INTERACTIONS
Bruce Freeman, John Luce, and Harry Sahlin 17 May 1972 6 p Presented at the 5th European Conf. on Controlled Fusion and Plasma Phys., Grenoble, 21-25 Aug. 1972
(UCRL-73932; Conf-720804-1) Avail: NTIS
In an attempt to get a zero-order approximation of the behavior of matter in a plasma focus, a one-dimensional computer calculation was performed. Author (NSA)

N73-15747# Massachusetts Inst. of Tech., Cambridge. Lab. for Plasma Physics.
MICROINSTABILITIES OF FINITE MIRROR-CONFINED PLASMAS Annual Progress Report, 1 Sep. 1971 - 31 May 1972
James D. Callen and James E. McCune Jun. 1972 9 p refs
(Contract AT(11-1)-2168)
(COO-2168-3) Avail: NTIS
Brief summaries of research are given for the following topics: (1) modified negative mass instability, (2) enhanced scattering inherent to loss cone particle distributions, and (3) radial eigenvalue problem for drift-cone modes. NSA

N73-15748# Stichting voor Fundamenteel Onderzoek der Materie, Jutphaas (Netherlands). Inst. voor Plasma-Fysica.
RECONSTRUCTION OF THE SCREW PINCH DEVICE SP 3
R. J. J. VanHeijningen and A. C. Griffioen Apr. 1972 27 p refs
(NP-19381; Rept-72-69) Avail: AEC Depository Libraries
In screw pinch devices a rapid decay of the toroidal plasma current has been observed, which eventually destroys the applied magnetic configuration. Since the loss of the poloidal magnetic flux is strongly dependent on the interaction of the plasma with the torus wall, a beneficial effect is to be expected from an improvement of the magnetic screening. Furthermore, the conservation of the poloidal flux within the plasma can be improved by a closely fitting shield around the torus, together with a suitable design of the primary toroidal circuit. To study the influence of these effects on the decay of the toroidal plasma current, the existing screw pinch device was reconstructed with an improved torus, with a better magnetic screening, and with a low-inductance primary toroidal circuit. Author (NSA)

N73-15749# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.
MICROWAVE MEASUREMENTS OF THE LOCAL SHEARING OF A MAGNETIC FIELD IN A PLASMA Ph.D. Thesis - Paris Univ., Orsay
G. Chaignot Feb. 1972 65 p refs In FRENCH

(EUR-CEA-FC-632) Avail: AEC Depository Libraries

A microwave diagnostics method, enabling the direction of a magnetic field in a confined plasma to be determined, is presented. The principle of this method resides in the existence of highly localized nonlinear phenomena in the plasma when an electromagnetic wave is propagated through it with the extraordinary mode perpendicular to the inhomogeneous magnetic field. An analysis of the polarization of the harmonic generated in the plasma allows the direction of the magnetic field at the point of interaction to be obtained. Varying the incident frequency or the principal magnetic field enables a spatial scanning of the plasma to be effected which allows the displacement in the plasma of the position of the measurement point, the shearing profile of the magnetic field being thus obtained. A series of experiments carried out under conditions simulating those of the plasma of the Tokamak machine are described. In particular, a measurement of the local shearing of a magnetic field was effected with a satisfactory accuracy and a very high spatial resolution.

NSA

N73-15750# Academy of Sciences (USSR), Leningrad.

INVESTIGATION OF ELECTRIC FIELDS WITHIN AN INTERACTION OF SUPERHIGH FREQUENT WAVES WITH PLASMA BY STARK EFFECT

V. I. Arkhipenko, V. N. Budnikov, and V. I. Varfolomeev 1972 13 p refs In RUSSIAN; ENGLISH summary

(FTI-413) Avail: AEC Depository Libraries

Experimental results on the determination of electric field amplitude within a superhigh frequency wave absorption by plasma are presented. Plasma was created by 3-cm superhigh frequency power supplied as H sub 2 waves to the plasma balloon through the round waveguide. Input power was 100 W, and the amplitude of superhigh frequency electric field in the waveguide within plasma was 150 V/cm. The end of the balloon had conical form. The half-widths of the H alpha, H sub beta H sub gamma lines were measured. This gave the possibility of obtaining the balloon length distribution of the radiating atom temperature and electric field amplitude. The maximum field value was 1.3 kV/cm. The strong field range was situated in the conical part and consisted of about 2 cm. Author (NSA)

N73-15751# Institute of Nuclear Research, Warsaw (Poland).

CONTOURS OF THE SPECTRAL LINES OF INHOMOGENEOUS PLASMA FOR APPARENT INCREASE OF OPTICAL THICKNESS (MEASUREMENTS OF PLASMA TEMPERATURE)

Yanush Litski and Shymon Sukever 1972 24 p refs In RUSSIAN; ENGLISH summary

(INR-1388) Avail: AEC Depository Libraries

Calculations of two spectral line contours (Na I 5688 A and Na I 5890 A) for a plasma with an inhomogeneous temperature, located between two parallel mirrors, are presented. The calculations were performed for a few values of the apparent increase of plasma optical thickness and two temperature distribution functions in the boundary layers. It was shown, that for 1/7 temperature distribution law, the accuracy of the temperature measurements by the method of registration of absolute intensity is practically the same as that by the spectral line reversal method for both lines. For a laminar-like plasma stream, better accuracy was obtained by using the line 5688 instead of the resonance lines. Author (NSA)

N73-15752# Japan Atomic Energy Research Inst., Tokyo.

SPECTROSCOPIC MEASUREMENTS IN THE TOKAMAK TYPE FACILITIES

Satoshi Kasai, Akimasa Funahashi, and Satoshi Itoh Sep. 1971 52 p refs In JAPANESE; ENGLISH summary

(JAERI-M-4596) Avail: AEC Depository Libraries

Spectroscopic measurements that have been performed in Tokamaks are reviewed. The descriptions are grouped into measurements of ion and electron temperatures, particle confinement-time, neutral-atom density, impurity, and MHD equilibrium and instabilities. In addition, previous results determined by spectroscopic methods are arranged in tabular form.

Author (NSA)

N73-15753# Academy of Sciences (USSR), Leningrad. Fiziko-Tekhnicheskii Inst.

HIGH FREQUENCY PLASMA HEATING

V. E. Golant and A. D. Piliya 1972 51 p refs In RUSSIAN; ENGLISH summary

(NP-19379) Avail: AEC Depository Libraries

Perspectives of high frequency plasma heating in quasi-stationary thermonuclear installations are discussed. Linear conversion of incident electromagnetic waves into heavily damped slow plasma waves is considered as a method of heating. In this respect, a brief review of both theoretical and experimental results on linear wave conversion is given. On the basis of available data, the possibilities of successful high frequency heating in large scale toroidal traps are estimated and problems are discussed. Results of recent experiments on high frequency plasma heating in Tokamak-type installations are presented.

Author (NSA)

N73-15754# Academy of Sciences (USSR), Leningrad.

FAST RADIAL MOTION OF TOROIDAL PLASMA COLUMN IN TRANSVERSE MAGNETIC FIELD

M. G. Kaganskii, V. A. Ovsyannikov, and S. S. Tyulpanov 1972 12 p refs In RUSSIAN; ENGLISH summary Submitted for publication

(NP-19401) Avail: AEC Depository Libraries

Results of the experiments on Tuman-2 device are described. A transverse magnetic field with amplitude up to 60 G and 50-microsecond and rise time was applied to an equilibrium plasma column inside a conductive shell. The plasma current was 5 kA. The measurements showed that column radial velocity was determined by velocity of the transverse field increase at small displacements. Sharp plasma column hindering was observed with a displacement increase. The effect was caused by cross current creation, which closes over the diaphragm.

Author (NSA)

N73-15755# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.

LECTURE TO THE SHERWOOD THEORY MEETING (ON MHD EQUILIBRIUM)

C. Mercier Mar. 1972 7 p Presented at Sherwood Theory Meeting, Los Alamos, N. Mex., 23-24 Mar. 1972

(CEA-Conf-2014; Conf-720330-1) Avail: AEC Depository Libraries

The class of localized perturbations of magnetohydrodynamic equilibrium states is discussed. A brief analysis is given for toroidal fields with circular cross sections. NSA

N73-15756# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Plasmadynamik.

PLASMA DIAGNOSTICS WITH THE HELP OF COLLISION-DOMINATED SPHERICAL ELECTROSTATIC PROBES [PLASMADIAGNOSTIK MIT HILFE VON STOSSBESTIMMTEN ELEKTROSTATISCHEN KUGELSONDEN]

Paul Wahle and Franz Kuenstler May 1971 76 p refs In GERMAN; ENGLISH summary

(DLR-FB-71-41) Avail: NTIS HC $6.00; DFVLR, Porz, West Ger. 22,30 DM

The feasibility of using electrostatic probe measurements to determine plasma parameters such as electron temperature, electron density, and plasma potential in the collision dominated plasma sheath is demonstrated. The experimental verification of a recently developed theory is described. A diagram showing a comparison of the collisionless and the collision dominated regimes is included. Author (ESRO)

N73-15757# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Energiewandlung und Elektrische Antriebe.

GENERAL INVESTIGATION AND PARAMETRIC STUDY OF INDUCTIVE MHD CONVERTERS INCLUDING DESIGN AND DEVELOPMENT OF A CRYOGENICALLY COOLED EXPERIMENTAL 4 kW CONVERTER [ALLGEMEINE THEORETISCHE UNTERSUCHUNGEN UND PARAMETRISCHE STUDIEN UEBER INDUKTIVE MHD-WANDLER SOWIE ENTWICKLUNG UND KONSTRUCTION EINES KRYOGEN GEKUEHLTEN 4-KW-WANDLERS FUER VERSUCHSZWECKE]

Constantin Carpetis and Andreas Gann Apr. 1971 274 p refs In GERMAN; ENGLISH summary

(DLR-FB-71-74) Avail: NTIS HC $15.75; DFVLR, Porz, West Ger. 80,30 DM

The problems anticipated in calculation and construction of inductive MHD-converters in the power range of a few kilowatts to 50 megawatts are discussed. Detailed analyses for an experimental 4 kW-converter with a cryogenically-cooled winding system are presented. The importance of the major loss mechanisms (channel wall eddy losses, flow friction and skin effect where cryogenic cooling is used), the actual construction problems and the power limits of such converters are stressed. Author (ESRO)

N73-15758# Arbeitsgruppe fuer Physikalische Weltraumforschung, Freiburg (West Germany).

MEASUREMENT OF ELECTRIC NOISE FIELDS DUE TO THERMODYNAMIC PLASMA FLUCTUATIONS AS A MEANS TO DETERMINE PLASMA PARAMETERS

Reinhard Grabowski 1972 11 p refs Presented at the 15th COSPAR Plenary Meeting, Madrid, 15-24 May 1972

Avail: NTIS HC $3.00

Thermodynamic density fluctuations in plasmas are associated with fluctuating electric fields. The root mean square potential difference induced by these fluctuations in a dipole-like double probe system has been calculated. In the upper ionosphere and in the magnetosphere values of about 10 to the minus 7th power to 10 to the minus 6th power volt are expected with 1 Hz bandwidth. Such levels should be measurable with a suitable probe system on a spacecraft. Since the noise spectrum depends on electron density, electron temperature, and ion temperature, its measurement should be useful for plasma analysis if complementary measurements of plasma parameters are available. Author (ESRO)

N73-15759# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INVESTIGATION OF THE INFLUENCE OF THE CATHODE TYPE ON THE DEIONIZATION PROPERTIES OF A POWERFUL PULSE DISCHARGE IN MERCURY VAPOR

N. N. Kempi, El K. Oreshnikova, Yu. M. Tarabasov, A. O. Khakhaev, and Yu. D. Khromov 25 Aug. 1972 11 p ref Transl. into ENGLISH from the book "Vopr. Fiz. Nizkotemperaturnoi Plazmy" Izd-vo Nauka i Tekh., 1970 p 217-219

(AF Proj. 4152)

(AD-750559; FTD-HT 23-854-72) Avail: NTIS CSCL 20/9

The concentration of charged particles and the electronic temperature of discharge plasma obtained in an ignitron were determined by means of central probes. The research was conducted on the basis of different types of cathodes: liquid or film. The measurement results obtained in this work show that a film cathode is characterized by a higher rate of vapor formation due to the passage of current pulses than does the liquid cathode. Author (GRA)

N73-15760# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

DISTORTION OF ENERGY DISTRIBUTION FUNCTION OF ELECTRONS MEASURED WITH CYLINDRICAL PROBE

A. I. Lukovnikov and M. Z. Novgorodov 29 Aug. 1972 12 p refs Transl. into ENGLISH from Kratkie Soobshch. po Fiz. (Moscow), no. 1, 1971 p 27-34

(AF Proj. 4152)

(AD-750961; FTD-HC-23-976-72) Avail: NTIS CSCL 20/9

The effect of the distortion of the energy distribution function of electrons measured with a spherical probe is examined. The distortion is based on the fact that the energy distribution function of the electrons reaching the surface of the probe is different from the distribution function in unexcited plasma due to the flow of electrons to the probe and the finite rate of diffusion. The effect increases as pressure and probe radius are increased and electron energy is decreased. Author

N73-15761# Aerospace Corp., El Segundo, Calif. Plasma Research Lab.

THE INDUCTION ARC, A STATE-OF-THE-ART REVIEW Report for Feb. - Jun. 1972

Hans U. Eckert 31 Oct. 1972 79 p refs

(Contract F04701-72-C-0073)

(AD-750742; TR-0073(3220-20)-2; SAMSO-TR-72-227) Avail: NTIS CSCL 20/9

The induction arc is, in principle, a high-frequency transformer in which the secondary is formed by a thermal plasma. Since its invention in 1961, this arc has been the subject of over 100 investigations with widely differing goals. Information contained in the literature up to 1972, covering history, experimental techniques, theory, and applications, has been collected and reviewed. Fair agreement between experimental and theoretical data indicates that heat balance and skin effect are the two basic processes governing the arc plasma. This agreement appears to be limited by non-equilibrium effects for which no provisions have been made in the theoretical models. The absence of contamination by electrode material makes the induction arc suitable for applications where a clean plasma is essential. The most important industrial application may be in plasma chemistry, provided such an arc can be operated more efficiently. A promising approach is low-frequency operation directly from the power line by means of a sufficiently large iron core. Author (GRA)

N73-15762# Naval Radiological Defense Lab., San Francisco, Calif. High Temperature Physics Branch.

NONTHERMAL PROCESS IN A LINEAR PINCH DEVICE Interim Report

T. N. Lee Sep. 1972 8 p refs Presented at the APS Topical Conf. on Pulsed High-Beta Plasmas (2d), Garching, West Germany, Jul. 1972

(AD-749688; NRL-MR-2502) Avail: NTIS CSCL 20/9

A low pressure, linear discharge initiated by focusing a pulsed laser beam between two electrodes produces a concentrated thermal plasma of (T sub e) about 8 keV and (N sub e) about 10 to the power of 21/cc. This plasma emits x-ray line radiation arising from highly stripped atoms such as hydrogen and helium-like iron ions. The temperature of the Fe XXV-ion estimated from Doppler line broadening is higher than the electron temperature, in agreement with the results obtained by Peacock, et al. The heating mechanism for attaining such high temperatures during the very short periods of interest is considered, and some experimental results supporting the contributions to the plasma heating by a non-thermal process are presented. Author (GRA)

N73-15763# Air Force Weapons Lab., Kirtland AFB, N.Mex.

SECOND ORDER EFFECTS IN THE WEIBEL INSTABILITY Technical Report, Jan. - Jun. 1972

K. A. Taggart, B. B. Godfrey, and C. E. Rhoades, Jr. Sep. 1972 17 p refs

(AD-750138; AFWL-TR-72-162) Avail: NTIS CSCL 20/9

An expression is derived for the coupling of two purely growing transverse Weibel modes in second order to give rise to a single electrostatic longitudinal mode. Comparison with numerical experiments shows agreement to within 5 percent for the magnitude and phase of the coupling. It is found that this mechanism does not contribute significantly to saturation of the instability. Author (GRA)

N73-15764# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THEORY OF A PULSED PLASMOID ACCELERATOR

A. A. Kulandin, O. M. Kazarnovskii, and A. V. Khoroshavin 11 Aug. 1972 12 p Transl. into ENGLISH from Magn. Gidrodin. (USSR), no. 2, 1970 p 139-141

(AD-750524; FTD-HT-23-517-72) Avail: NTIS CSCL 20/9

The basic relationships involved in plasma acceleration are considered in addition to the main parameters of accelerators and their characteristics. A number of conclusions are drawn, the most important being that approximate formulae for the velocity, electrode length and emf of the store give results close to those obtained by numerical solutions of the accelerator equations. Formulae and graphs are obtained which simplify the problem of selecting the optimum combination of parameters for a given accelerator. Author (GRA)

N73-15765# Stanford Univ., Calif. Inst. for Plasma Research.

LOW FREQUENCY INSTABILITIES IN INHOMOGENEOUS MAGNETOPLASMA Final Report, 1 Jun. 1971 - 31 May 1972

Sidney A. Self and Frederick W. Crawford Jun. 1972 20 p refs

(Contract F44620-71-C-0076; AF Proj. 9767)
(AD-750477; SU-IPR-483; AFOSR-72-2006TR) Avail: NTIS CSCL 20/9

The research covers hollow cathode discharge (HCD) mechanisms and instabilities. Positive column theories of steady state magnetized discharges are extended to finite cylinder geometries by separation of variables. Low frequency instabilities in HCD's are identified as centrifugal flute modes driven by non-uniform E/Br rotation and stabilized by infinite Larmor radius effects. Author (GRA)

N73-15766# Princeton Univ., N.J. Plasma Physics Lab.
RESEARCH ON PLASMA SIMULATION BY COMPUTER FOR STUDIES OF COLLISIONLESS SHOCKS AND PLASMA TURBULENCE Final Report
John M. Dawson Nov. 1972 6 p refs
(Contract N00014-67-A-0151-0021)
(AD-750715) Avail: NTIS CSCL 20/9

The research dealt with the development of numerical techniques for simulating plasmas and the application of these techniques to solve important problems on the nonlinear and turbulent behavior of plasmas. A number of significant problems were solved on the anomalous absorption of intense radiation by plasma, and on the anomalous diffusion of plasma across a magnetic field. Author (GRA)

N73-15767# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
EFFECT OF DIFFUSION ON LASER INDUCED BREAKDOWN OF GASES
Ronald L. Fante 15 Aug. 1972 23 p refs
(AD-750874; AFCRL-72-0479; AFCRL-PSRP-506) Avail: NTIS CSCL 20/9

A variational method has been developed to account for the effect of diffusion on laser induced breakdown. The method is applicable for arbitrary distributions of intensity in the focal volume. It has been specifically applied to the calculation of breakdown for Gaussian spots, and found to yield breakdown intensities differing by nearly a factor of 2 from calculations employing simplified diffusion models. Author (GRA)

26 PHYSICS, SOLID-STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N73-15768# National Bureau of Standards, Washington, D.C. Heat Div.
STANDARD REFERENCE MATERIALS: PREPARATION AND USE OF SUPERCONDUCTIVE FIXED POINT DEVICES, SRM 767 Final Report
J. F. Schooley, R. J. Soulen, Jr., and G. A. Evans, Jr. Dec. 1972 33 p refs
(NBS-SP-260-44; LC-72-600339) Avail: SOD $0.75 as C 13.10:260-44

The preparation, testing, and use of SRM 767 devices are described. These devices incorporate samples of lead, indium, aluminum, zinc, and cadmium within a mutual inductance coil pair. These elements become superconductive at temperatures near 7.2 K, 3.4 K, 1.2 K, 0.85 K and 0.5 K, respectively, and the transition midpoints, when attained by observing the sample magnetic susceptibilities in negligible small magnetic fields, provide thermometric reference points which are reproducible to + or - 1 mK. Author

N73-15769# Pisa Univ. (Italy). School of Engineering.
ON THE ELECTRIC PARAMETERS OF RECTANGULAR SOLID SUPERCONDUCTORS IMMERSED IN A CAVITY [SUI PARAMETRI ELETTRICI DI PIU CONDUTTORI MASSICCI DI SEZIONE RETTANGOLARE IMMERSI IN CAVA]
Ottorino Bruno (Florence Univ.), Lucio Taponecco, and Giancarlo Zini Feb. 1972 21 p refs In ITALIAN *Its* Ser. 29a
(Publ-1409; Rept-123) Avail: NTIS HC $3.25

The electric parameters are determined, and the analytical expression is derived for the current density distribution of rectangular n barriers immersed in an open cavity of an electric motor. The specific case is considered of two barriers per cavity. The electrical parameters are evaluated including: the resistance and reactance of each barrier as a function of the height of the cavity; the response between the current modules; and the relative phase. Transl. by F.O.S.

N73-15770# Technische Hochschule, Munich (West Germany).
PHOTOIONIZATION CROSS SECTION MEASUREMENT ON BARIUM I IN THE 2400 TO 2100 A SPECTRAL REGION BY ATOMIC BEAM METHOD Ph.D. Thesis [MESSUNG DES PHOTOIONISATIONSQUERSCHNITTS VON Ba I IM SPEKTRALBEREICH VON 2400 - 2100 A MIT EINER ATOMSTRAHLMETHODE]
Herbert Schulte 24 Jan. 1972 68 p refs In GERMAN
Avail: NTIS HC $5.50

Measurements of neutral particle density, ultraviolet radiation intensity, and ionization rate on an optically thin atomic barium beam are utilized to determine barium photoionization cross sections. Transl. by G.G.

N73-15771# Helsinki Univ. of Technology, Otaniemi (Finland).
ELECTRICAL AND PHOTOELECTRICAL PROPERTIES OF TRIGONAL SELENIUM SINGLE CRYSTALS Ph.D. Thesis
Jouni Heleskivi 1972 24 p refs
(Publ-170) Avail: NTIS HC $3.25

The Hall mobility increases exponentially with increasing temperature whereas direct mobility measuring methods give a mobility which decreases. This discrepancy is explained by assuming that the crystal contains internal barriers. The frequency and the field strength dependence of the conductivity are also explained with the barrier model. The photoconductivity can be associated with a decrease in the barrier height rather than by an increase in the carrier concentration by illumination. Some possible recombination mechanisms are reviewed. Author

N73-15772# National Bureau of Standards, Boulder, Colo. Inst. for Basic Standards.
DEVELOPMENTS IN CRYOELECTRONICS
R. A. Kamper and D. B. Sullivan Nov. 1972 73 p refs
(NBS-TN-630) Avail: SOD $0.70 as C13.46:630

Josephson junctions and the superconducting quantum interference devices were found to have a significant impact on magnetometry, computers, electrical meteorology, far infrared receivers, and galvanometers. The simple properties of superconducting materials, such as the Meissner effect and the drastic reduction of electrical dissipation was used to improve the performance of information transmission lines, pulse delay lines, stable oscillators, and accelerometers. J.A.M.

N73-15773# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
SUPERCONDUCTING QUANTUM INTERFERENCE DEVICES: AN OPERATIONAL GUIDE FOR rf-BIASED SYSTEMS
D. B. Sullivan Nov. 1972 45 p refs
(NBS-TN-629) Avail: SOD $0.50 as C13.46:629

A number of practical considerations concerning the operation and application of RF-biased superconducting quantum interference devices (SQUID's) are presented. Topics of discussion include: the readout circuitry, operational limits of the SQUID, RF- coupling to the SQUID, flux transformers, and shielding. Author

N73-15774*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SELECTION AND PRELIMINARY EVALUATION OF THREE STRUCTURES AS POTENTIAL SOLID CONDUCTORS OF ALKALI IONS: TWO HOLLANDITES, A TITANATE, AND A TUNGSTATE
Joseph Singer, Harold E. Kautz, William L. Fielder, and J. Stuart Fordyce Washington Jan. 1973 17 p refs
(NASA-TN-D-7157; E-7022) Avail: NTIS HC $3.00 CSCL 20L

Utilization of crystal-chemical criteria has suggested three structure types in which alkali ions may be mobile: (1)hollandites K(x)Mg(x/2)Ti(8-x/2)O16 and K(x)Al(x)Ti(8-x)O16 for 1.6 less

than or equal to x less than or equal to 2.0 tungstate K2W4013; and (3) sodium hexatitante Na2Ti6O13. Each is a tunnel structure. An electrical screening procedure, previously tested on beta-alumina, has indicated high K(+) ion mobility in the hollandites and in the tungstate, but not in the hexatitanate. Specimens were polycrystalline disks near 90 percent of theoretical density. The ac conductivity calculated from dielectric and capacitance measurements has been attributed to ion mobility. This ac conductivity was up to 0.01/ohm-cm for hollandites and about 0.0001/ohm-cm for the tungstate, with approximate activation energies of 21 to 25 and 16 kJ/mole (5 to 6 and 4 kcal/mole), respectively. Electronic conduction and chemical reactivity have eliminated the tungstate from further consideration. The hollandites have been considered worthy of further development and evaluation. Author

N73-15775*# Scripta Technica, Inc., Washington, D.C.
USE OF THE CHARACTERISTIC X-RAY TEMPERATURE OF VANADIUM FOR THE ESTIMATION OF INTERATOMIC BONDS IN ITS CRYSTAL LATTICE
V. P. Mikhalchenko and V. B. Lototskiy NASA Jan. 1973 5 p refs Transl. into ENGLISH from Fiz. Metal. i Metalloved. (USSR), v. 32, 1971 p 1300-1302
(Contract NASw-2036)
(NASA-TT-F-13913) Avail: NTIS HC $3.00 CSCL 20L

A formula is given for calculating the intensity of elastic and inelastic X-ray scattering in the crystal lattice of vanadium. Experimental measurements and calculations based on this formula show that the characteristic X-ray temperature of vanadium is practically insensitive to interactions between remote atoms and to off-center interactions in its crystal lattice. Author

N73-15776# Oak Ridge National Lab., Tenn.
SOLID STATE DIVISION Annual Progress Report, period ending 31 Dec. 1971
Apr. 1972 131 p refs
(Contract W-7405-eng-26)
(ORNL-4779) Avail: NTIS

Separate abstracts were prepared for each of the 8 sections: surface studies, diffraction, and channeling; radiation damage; low-temperature properties; lattice dynamics; magnetic properties; electronic structure and spectroscopy; research materials; and experimental equipment and new techniques.
Author (NSA)

N73-15777# California Univ., Berkeley. Lawrence Berkeley Lab.
LOW FREQUENCY MEASUREMENTS WITH JOSEPHSON DEVICES
John C. Clarke May 1972 5 p refs Presented at the Appl. Superconductivity Meeting, Annapolis, Md., 1-3 May 1972
(Contract W-7405-eng-48)
(LBL-845; Conf-720513-11) Avail: NTIS

The application of Josephson devices to the measurement of low frequency magnetic fields and voltages is surveyed. The various types of Josephson junctions are described. The sensitivities of dc and RF SQUIDs are compared, and the noise limits of these devices discussed. The inherent noise of a device with inductance of nH is expected to be of order 1 millionth (phi sub 0)(sq root of Hz), whereas the observed noise limit is typically 0.001 to 0.0001 (phi sub 0)(sq root of Hz), implying that noise in the room temperature electronics and/or environmental noise are the limiting factors. The magnetic field sensitivity of SQUIDs may be improved by the use of a flux transformer to perhaps 10 to the minus 14th power T(sq root of Hz). Transformer coupling also greatly extends the range of SQUIDs used as voltmeters; in the He-4 temperature range, it is possible for the measurement to be Johnson noise limited in circuits whose resistance is < or approximately = 1 ohm.
Author (NSA)

N73-15778# California Univ., Berkeley. Lawrence Berkeley Lab.
PULSED MAGNETIC FIELDS AND THE CRITICAL CURRENT DENSITIES OF SUPERCONDUCTING Nb3Sn STRIPS IN THESE FIELDS
Terry Nathaniel Garrett Dec. 1971 40 p refs
(Contract W-7405-eng-48)
(LBL-448) Avail: NTIS

A 70 KJ capacitor bank installation for the generation of pulsed magnetic fields is described. The construction of a helical magnet coil is discussed. The apparatus was used to study the effect of cold work on Nb3Sn samples prepared by a new technique. The microstructure of the samples produced by this technique were examined using anodic etching. The microstructure consisted of a network of continuous Nb3Sn filaments in a matrix of niobium. In a sample that was highly cold worked, the filaments were about one micron in diameter in a niobium matrix. A current density of 75,000 amp/sq. cm at 120 kG was obtained.
Author (NSA)

N73-15779# Utah Univ., Salt Lake City. Div. of Materials Science and Engineering.
POSITRON LIFETIME MEASUREMENTS AS A NONDESTRUCTIVE TECHNIQUE TO MONITOR FATIGUE DAMAGE Annual Progress Report, 1 Jan. - 31 Dec. 1971
J. G. Byrne 19 Jan. 1972 9 p refs
(Contract AT(11-1)-2128)
(COO-2128-2; UTEC-MSE-72-24) Avail: NTIS

Measurements of positron lifetime distributions were applied to characterize plastic deformation in crystals. Of principal interest is the plastic deformation caused by cyclic fatigue. Positron lifetime distribution curves were acquired on various grain sizes of copper and nickel and on some deformed specimens. Both copper and nickel specimens were studied thoroughly in terms of grain size for various annealing temperatures. Author

N73-15780# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Experimentelle Kernphysik.
ON MAGNETIC-THERMAL BREAKDOWN IN SUPERCONDUCTING RF CAVITIES
J. Halbritter May 1972 15 p refs
(KFK-EXT-3/72-2) Avail: AEC Depository Libraries

Whereas in normal conducting cavities the RF field strengths are limited by discharges due to high electric fields, in superconducting cavities the actual limitation is an RF breakdown related to the magnetic field and the low-breakdown fields observed are a severe drawback for some practical applications. This new type of breakdown is due to an RF absorption strongly increasing with temperature, especially near the phase transition from the superconducting to the normal conducting state. As in all thermodynamic phase transitions of first order, the breakdown is initiated by nucleation of normal conducting regions. Therefore, it will be more difficult to reach RF fields near Hc(T) in superconductors with a coherence length short compared to the penetration depth, e.g., Nb, than, e.g., in In, Sn, and Pb. This model can explain the observed dependencies of Hcrit on material parameters and temperature, which shows that the thermal conductivity does not define Hcrit. Author (NSA)

N73-15781# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Experimentelle Kernphysik.
ON REAL NIOBIUM SURFACES FOR SUPERCONDUCTING rf CAVITIES
J. Halbritter Mar. 1972 24 p refs
(KFK-EXT-3/72-3) Avail: AEC Depository Libraries

The last years have shown that massive niobium is the most promising candidate in the field of superconducting RF cavities. For example, in niobium cavities RF field strengths of Hcrit is approximately equal to 1,000 G at surface resistance of R is approximately equal to 10 to the minus 8th power ohms were observed. But, also, in similarly prepared cavities, worse results were measured - results that are even inferior to values obtained in lead-plated cavities. The reasons for these discrepancies are surface effects, which are discussed and related to chemical and physical properties of Nb, of Nb with impurities, and of niobium oxides. Author (NSA)

N73-15782# Defence Research Information Centre, Orpington (England).
SMALL ETCHING PITS IN EPITAXIAL GALLIUM ARSENIDE
O. M. Ivleva, M. P. Yakubeniya et al Nov. 1972 6 p refs Transl. into ENGLISH from J. Sov. Phys. Isv. Vuz. Fiz. (USSR), v. 1, 1971 p 148-149
(DRIC-Trans-2928; BR-30297) Avail: NTIS HC

An investigation into the structure of autoepitaxial layers of

gallium arsenide by means of a metallographic method using an oblique polished section is briefly described together with the discovery of small etching pits in the epitaxial layer. It is concluded that these can be attributed to the accumulation of atoms of impurities. Author (ESRO)

N73-15783# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INVESTIGATING THE POSSIBILITIES OF INCREASING THE STABILITY OF THE PHOTOELECTRIC CHARACTERISTICS OF IRRADIATED SILICON N-P JUNCTIONS
G. M. Grigorev, L. B. Krenin, and A. P. Landsman 11 Aug. 1972 16 p refs Transl. into ENGLISH from the publ. "Radiatsionnaya Fizika Nemetallicheskikh Kristallov" Minsk, Izd-vo Nauka i Tekhn., 1970 p 167-173
(AD-750977; FTD-MT-24-15-72) Avail: NTIS CSCL 20/12

Experiments on annealing irradiated silicon n-p junctions made of p-type material and on the effect of proton bombardment of n-p junctions based on n-type silicon with lithium admixture are discussed. The experiments indicated that the lithium admixture in the silicon neutralizes the recombination centers regardless of the method of their introduction. The photoelectric characteristics of n-p junctions alloyed with lithium prove to be less sensitive to proton irradiation than the characteristics of junctions made from p-type conductivity silicon. Author

N73-15784# Rochester Univ., N.Y. Dept. of Electrical Engineering.
JOSEPHSON FREQUENCY CONVERSION IN SUPERCONDUCTING POINT-CONTACT JUNCTIONS Ph.D. Thesis
Andrew Longacre, Jr. Oct. 1972 122 p refs
(Contract N00014-67-A-0398-0003)
(AD-750775) Avail: NTIS CSCL 09/1

The term Josephson frequency conversion refers to a mode of operating the Josephson junction wherein it acts as both the local oscillator and mixer in a form of heterodyne conversion. This thesis presents both experimental and analytical results arising from the demonstration and study of that frequency-converting property in superconducting point-contact junctions. Author (GRA)

N73-15785# Texas Univ., Austin.
AMORPHOUS SEMICONDUCTORS Semiannual Technical Report, 1 Apr. - 30 Sep. 1972
James C. Thompson 30 Sep. 1972 11 p refs
(Grant DA-ARO(D)-31-124-72-G75; ARPA Order 1562)
(AD-750397) Avail: NTIS CSCL 20/12

Direct measurements of the isothermal compressibility have been made to complement the adiabatic compressibility determined acoustically. The heat capacity ratio gamma is identically equal to (C sup p)/(C sub v) is near unity. Acoustic determinations of the glass transition are being made. Author (GRA)

N73-15786# Case Western Reserve Univ., Cleveland, Ohio.
FERMI SURFACE OF DILUTE ALLOYS Final Report, 16 Mar. 1965 - 30 Jun. 1972
W. L. Gordon 27 Oct. 1972 35 p refs
(Contract DA-31-124-ARO(D)-342; DA Proj. 200-61102-B-11B)
(AD-750726; AROD-4987-3-P) Avail: NTIS CSCL 20/12

Fermi surface changes in dilute alloys of aluminum, of cadmium and of zinc were explored by de Haas-van Alphen methods. In aluminum, nontransition metal solutes of greater and lesser valence produced changes consistent with the rigid band model and no anisotropy of electron scattering was observed on the small portions of the Fermi surface studied here. In the isoelectronic alloys ZnCd and ZnHg as well asCd Mg, the influence of axial ratio changes have been determined on Fermi surface parameters and steady susceptibility. Finally, the effect of precipitation on the scattering temperature and on magnetic breakdown was investigated in supersaturated ZnCd alloys. Author (GRA)

N73-15787# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
REAL STRUCTURE STUDIES ON A(3)B(5) SEMICONDUCTOR CRYSTALS
W. Schmidt 31 Aug. 1972 32 p refs Transl. into ENGLISH from Wiss. Z. (Leipzig), v. 20, no. 1, 1971 p 73-92
(AF Proj. 1370)
(AD-750966; FTD-HC-23-705-72) Avail: NTIS CSCL 20/2

The paper reviews experimental methods for the study of semiconductor crystals, and particularly crystals of A(III)B(V) semiconducting compounds. Various types of crystal disorders are discussed. Author (GRA)

N73-15788# Maryland Univ., College Park.
OPTICAL AND ELECTRICAL PROPERTIES OF AMORPHOUS ELEMENTAL SEMICONDUCTORS Semiannual Technical Report, 31 Dec. 1971 - 30 Jun. 1972
Rolfe E. Glover, III and Robert Glosser 30 Jun. 1972 6 p refs
(Grant DA-ARO(D)-31-124-71-G134; ARPA Order 1562)
(AD-748856; AROD-9290-3) Avail: NTIS CSCL 20/12

A number of films of amorphous germanium have been deposited at liquid helium temperature and the electrical and optical properties and the effect of annealing on these properties have been investigated. Previous work on amorphous silicon is also reviewed. GRA

N73-15789# Utah Univ., Salt Lake City. Dept. of Physics.
ELECTRONIC AND RADIATION DAMAGE PROPERTIES OF RUTILE Technical Report, 1 Dec. 1971 - 31 Jul. 1972
John W. Deford, Owen W. Johnson, and Franz Rosenberger 31 Jul. 1972 86 p refs
(Grant DAHC15-71-G-0008; ARPA Order 1610)
(AD-748298) Avail: NTIS CSCL 20/12

The report covers the period from December 1, 1971 to July 31, 1972. During this period work was concentrated in the areas of: crystal growth, hydrogen kinetics(theoretical), hydrogen kinetics(experimental), devices, far IR spectroscopy, magnetic resonance study of defect states, free carrier optical absorption, hydrogen diffusion, and electron trapping states. GRA

N73-15790# Defence Research Information Centre, Orpington (England).
SURFACE SPACE CHARGE EFFECT ON CERTAIN PHOTOELECTRIC PROPERTIES OF GALLIUM ARSENIDE (P TYPE)
O. Yu. Borkovskaya Oct. 1972 8 p refs Transl. into ENGLISH from UKR. Fiz. Zh. (USSR), v. 17, no. 5, May 1972 p 835-838
(AD-750696; DRIC-TRANS-2913; BR-30284) Avail: NTIS CSCL 20/12

The report presents an examination of p-type GaAs. The author examined spectral and temperature characteristics of natural photoconductivity and condensation photo e.m.f. and also the effect on them of an external transverse electrical field and constant brightness. GRA

N73-15791# Naval Ordnance Lab., White Oak, Md.
NEUTRON INDUCED DAMAGE IN p- AND n-TYPE PbS SINGLE CRYSTAL FILMS Ph.D. Thesis - Maryland Univ.
Ronald M. Culpeper 4 Aug. 1972 194 p refs
(ZR00001010)
(AD-749689; NOLTR-72-119) Avail: NTIS CSCL 20/12

The Hall coefficient, resistivity, and charge carrier mobility of epitaxial films of n- and p-type PbS having carrier concentrations between 1 x 10 to the 17th power/cc and 1 x 10 to the 18th power/cc were measured in the temperature range of 4.5 and 300K before and after successive neutron irradiations. The irradiations in the National Bureau of Standards reactor at Gaithersburg, Maryland were in four steps of approximately 3.5 x 10 to the 16th power neutrons per sq. cm. each. The variation of the Hall coefficient with irradiation level was used to calculate the carrier removal rate. Information about radiation induced localized energy states in the energy band gap obtained from change of the Hall coefficient with temperature. The variation of mobility with temperature provided information about the defect scattering mechanism Cascade displacement theory was applied to PbS to predict the concentrations of Pb and S displacements. This information in conjunction with the carrier removal rate gave the number of removals per defect pair. Author (GRA)

N73-15792# Army Missile Command, Redstone Arsenal, Ala. Systems Engineering and Integration Office.
A LAPLACE TRANSFORM AMPLITUDE FUNCTION

GENERATOR UTILIZING A THIN FILM SEMICONDUCTOR
James E. Brown, Jr. 31 Jul. 1972 94 p refs
(AD-750590; RC-TR-72-2) Avail: NTIS CSCL 14/2

The characteristics of many systems can be predetermined by application of an analog. The report was developed to produce a better tool in the area of the electric field analog. It develops as a straightforward proof of the analog existence with the main body being experimental. The experimental area develops in normal form with early familiarization methods through various phases to the final result. The semiconductor can be used with more consistency, and better results, than any present guaranteed device on the market. Author (GRA)

N73-15793# Office of Naval Research, London (England).
CRYSTAL GROWTH FROM THE VAPOR PHASE AND EPITAXY: AN INTERNATIONAL CONFERENCE
Immauel Estermann 7 Sep. 1972 26 p refs Conf. held at Jerusalem, 21-25 May 1972
(AD-750654; ONRL-C-13-72) Avail: NTIS CSCL 20/2

The main topic of the Conference was the relationship of scientific progress to industrial application in the semiconductor and microelectronics fields. Subjects discussed included material transport, nucleation, and crystal growth, especially in their relation to the production of epitaxial films for use in electronic devices. One of the newer techniques presented was liquid phase epitaxy in which the epitaxial layer is precipitated from a supersaturated or supercooled solution on a crystalline substrate. Properties of various epitaxial films and methods for their evaluation were another subject for discussion. Author (GRA)

N73-15794# Cornell Univ., Ithaca, N.Y. Materials Science Center.
FLUCTUATION INDUCED DIAMAGNETISM IN BULK Al AND Al ALLOYS ABOVE THE SUPERCONDUCTING TRANSITION TEMPERATURE
John H. Claassen and Watt W. Webb 1 Sep. 1972 14 p refs
(Contract N00014-67-A-0077-0016; NR Proj. 319-032)
(AD-750275; MSC-01868; TR-11) Avail: NTIS CSCL 20/12

The authors have made careful measurements of the small fluctuation-induced diamagnetic moment above the superconducting transition temperature T(c) in pure Al and some alloys, with an accuracy of 2 x 10 to the minus 9th power G. The measurements covered a range of magnetic fields from .01 Oe to = 100 Oe and temperatures from T(c) to as high as 5K. Author (GRA)

N73-15795# University of Southern Calif., Los Angeles. Dept. of Physics.
SUPERCONDUCTING MICROWAVE CAVITIES AND JOSEPHSON JUNCTIONS
Todd I. Smith 31 Mar. 1972 23 p refs
(Contract N00014-67-A-0269-0011; NR Proj. 319-020)
(AD-749986) Avail: NTIS CSCL 20/12

The possibility of using very high Q superconducting microwave cavities to obtain a strong coupling between the electromagnetic field and a Josephson junction has prompted a study of such systems. Expressions have been obtained describing the dc I-V characteristic of a junction biased so that the Josephson radiation frequency is near a resonance of the cavity in which it is located. The rf power coupled into an X-band (10 GHZ) TE(011) mode cavity from a weakly coupled junction is approximately 3 x 10 to the-13th power (I sub 0) squared Q watts, where I sub 0 is the critical current of the junction and Q is the cavity Q. When the coupling between the junction and cavity is large enough, the I-V characteristic becomes multiple valued and the power coupled to the cavity depends on the state of the system. The maximum power which can be coupled to the cavity is approximately 0.58 I sub 0 V(dc), where V(dc) is the voltage required to bias the junction to the resonant frequency of the cavity. Author (GRA)

N73-15796# University of Southern Calif., Los Angeles. Dept. of Physics.
EXPERIMENTS ON THE LINE WIDTH AND POWER OUTPUT OF RADIATION FROM A JOSEPHSON JUNCTION Final Report, 1 Apr. 1969 - 31 Mar. 1972
Todd I. Smith 31 Mar. 1972 8 p refs
(Contract N00014-67-A-0269-0011; NR Proj. 319-020)
(AD-749981) Avail: NTIS CSCL 20/12

The document is the final report on work intended to study the properties of evaporated Josephson junctions coupled to high Q superconducting microwave cavities. The report discusses areas in which experimental and theoretical advances have been made, as well as areas in which problems remain. Author (GRA)

N73-15797# Purdue Univ., Lafayette, Ind. Dept. of Physics.
SEMICONDUCTORS Final Report, 1 Oct. 1966 - 31 Mar. 1972
H. Y. Fan Sep. 1972 25 p refs
(Contract DA-31-124-ARO(D)-17; DA Proj. 200-61102-B-11B)
(AD-750163; AROD-6782-31-P) Avail: NTIS CSCL 20/12

The research reported herein concerns various properties of semiconductors: electrical transport phenomena, optical phenomena, microwave propagation, microwave resonance, superconductivity and low-temperature thermal properties. The materials studied included elemental semiconductors and various compounds, III-V, II-VI, other compounds and oxides. Many of the results have been published in various scientific journals. A summary of the work is presented with emphasis on the work of recent years in the main areas. A list of the publications and a list of the PhD theses completed in connection with the research of the contract are included. Author (GRA)

N73-15798# Maryland Univ., College Park. Dept. of Electrical Engineering.
THE STUDY OF THE INTERACTION OF INTENSE PICOSECOND LIGHT PULSE WITH MATERIALS Quarterly Technical Report, 22 Mar. - 22 Jun. 1972
Chi H. Lee and S. Jayaraman 1 Aug. 1972 20 p refs
(Grant DA-ARO(D)-31-124-72-G82; ARPA Order 675)
(AD-750414; TR-10) Avail: NTIS CSCL 20/12

Two-photon conductivity effect in GaAs has been used to map the second order intensity correlation function of the picosecond laser pulse for the first time. Reproducible data were obtained. The contrast ratio is about 1.8. This is limited by the thickness of the sample. In principle this method can be extended to use a very thin sample to obtained subpicosecond time resolution. Three photon induced photoconductivity effect has been observed in CdS polycrystalline sample with a mode-locked Nd glass laser. The three photo absorption coefficient was measured to be 0.043 cc/G(W sq). Author (GRA)

N73-15799# Dayton Univ. Research Inst., Ohio.
A PRELIMINARY STUDY OF THE ELECTRICAL PROPERTIES OF SEMICONDUCTING CdF2 WITH Ce(3 PLUS) AND Gd(3 PLUS) CODOPANTS Technical Report, 1 May 1970 - 1 Dec. 1971
Michael A. Bafico and Perry P. Yaney Wright-Patterson AFB, Ohio AFML Aug. 1972 100 p refs
(Contract F33615-71-C-1121; AF Proj. 7371)
(AD-750937; UDRI-TR-72-37; AFML-TR-72-140) Avail: NTIS CSCL 20/12

Electrical measurements were made on insulating and semiconducting Gd(3+)CdF2Ce(3+) samples. The gadolinium concentration was held at .02 mole % while the cerium concentrations were .006, .02 and .06 mole %. Samples were heated at 520C in a Cd vapor for 30 minutes and quenched to room temperature. Various electrode metals were studied, including Ag, In, Hg-In alloy and Au. The techniques of applying these electrodes included vacuum deposition, thermal soldering and ultrasonic soldering. Complex dielectric constants were measured over the frequency range of 50 Hz to 20 MHz. The large real dielectric constants found were attributed to a depletion layer formed within the sample. A voltage dependent capacitance was observed. Bulk resistivities were obtained using a pulse technique. Author (GRA)

N73-15800# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDY OF THE NATURE OF A p-n IN A CdSe MONOCRYSTAL OBTAINED BY THE GAS TRANSPORT METHOD
G. A. Mamedova and M. Ya. Bakirov 2 Aug. 1972 11 p refs Transl. into ENGLISH from Akad. Nauk Azerb. SSR, I Mat. Nauk (USSR), no. 6, 1969 p 6-8
(AF Proj. 7350)

(AD-750506; FTD-HT-23-262-72) Avail: NTIS CSCL 20/12

CdSe is one of the effective materials for the creation of photoelectric converters. The paper is concerned with a study of the nature of the p-n-junction in a CdSe monocrystal. The monocrystals used in this project were grown by the gas transport method. They were black in color, lobe-shaped with an area of 1 to 4 times to the (-2) power/sq cm and a thickness of 0.01-0.03 cm, possessed electron conductivity, a specific resistance at room temperature of 130-150 ohms/cm, an electron concentration of n(e) about 10 to the 16th power cc, and a mobility of eta(e) about 300 sq cm/v-s. GRA

N73-15801# Notre Dame Univ., Ind. Dept. of Metallurgical Engineering and Materials Science.

DISLOCATION DAMPING IN SINGLE CRYSTALS OF CONTROLLED SUBSTRUCTURE Final Report, 1 Sep. 1967 - 31 Aug. 1972

Nicholas F. Fiore 1 Oct. 1972 9 p refs

(Contract DA-ARO(D)-31-124-G936; DA Proj. 200-61102-B-32D)

(AD-750712; AROD-7119-8-MC) Avail: NTIS CSCL 20/12

Techniques have been developed for reproducibly growing Cu single crystals of controlled dislocation cell size and controlled random dislocation density. The ultrasonic pulse-echo attenuation of the crystals of various substructure has been measured from 2 to 100 MHz. The resonance bar damping of the crystals has been measured from 2 to 250 kHz. The damping and attenuation have been found to strong functions of substructure, and the vibrating membrane modification of the Granato-Lucke theory of dislocation damping has been proposed to explain the relationship. Author (GRA)

N73-15802# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Physics.

THEORETICAL STUDIES OF SOLID SURFACES Final Report, 1 Feb. 1969 - 31 Jul. 1972

D. S. Boudreaux and J. B. Krieger 30 Sep. 1972 12 p refs

(Grant AF-AFOSR-1709-69; AF Proj. 9761)

(AD-750481; PIBPH-72-009; AFOSR-72-1731TR) Avail: NTIS CSCL 20/12

Presented is the final report for three and one-half years of theoretical study on the physics of solid surfaces. Progress was made in the interpretation of electron diffraction experiments, and in the determination of the electronic charge distribution in the vicinity of a solid surface and its consequences. Author (GRA)

N73-15803# Hebrew Univ., Jerusalem (Israel).

RADIATION EFFECTS ON QUARTZ CRYSTALS AND OSCILLATORS, AND GROWTH OF DOPED QUARTZ CRYSTALS Final Report, 1 Jan. 1969 - 31 Dec. 1971

A. Halperin, M. Schieber, A. A. Braner, J. Levinson, and D. Zloto May 1972 63 p refs

(Contract F61052-69-C-0015)

(AD-750467; AFCRL-72-0506) Avail: NTIS CSCL 09/1

Quartz crystals containing V(5-), Ga(3-), Mg(2-), Ge(4-) and Zn(2-) were grown. Kinetics of growth, segregation of the impurities and mechanical Q values of the crystals were investigated. Electron probe analysis has revealed in the grown crystals circular defects, some 2 - 15 microns in diameter. All investigated impurities were found to concentrate preferentially in these defects. Preliminary results have shown comparatively higher Q-values in Zn(2-) containing crystals. Radiation effects were investigated in various natural and synthetic resonators, before and after sweeping-in various monovalent ions. Thermoluminescence and thermally stimulated currents in the irradiated crystals were examined and a possible correlation between these properties and the piezoelectric properties was indicated. GRA

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N73-15804*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SOLID PROPELLANT GRAIN DESIGN AND INTERNAL BALLISTICS Space Vehicle Design Criteria (Chemical Propulsion)

Mar. 1972 110 p refs

(NASA-SP-8076) Avail: NTIS HC $3.00 CSCL 21I

The ballistic aspects of grain design were studied to outline the steps necessary to achieve a successful grain design. The relationships of the grain design to steady-state mass balance and erosive burning are considered. Grain design criteria are reviewed, and recommended design criteria are included. F.O.S.

N73-15805# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Lampoldshausen (West Germany). Inst. fuer Chemische Raketenantriebe.

INVESTIGATION OF THE SYSTEM INSTABILITY IN A GAS/LIQUID BIPROPELLANT ROCKET ENGINE [UNTERSUCHUNGEN ZUR SYSTEMINSTABILITAET IN EINEM GAS/FLUESSIG-ZWEISTOFFRAKETENTRIEBWERK]

Hans-Guenther Ruppik Mar. 1971 48 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.

(DLR-FB-71-47) Avail: NTIS HC $4.50; DFVLR, Porz, West Ger. 15,10 DM

Boundaries of system instability were determined experimentally with the propellant combination gaseous-hydrogen/liquid-oxygen over broad ranges of operating and design conditions for a rocket motor with a 6.5 cm internal cylindrical combustion chamber diameter and the nine element coaxial injector system. The influence of variation of the combustion parameter, chamber pressure, and mixture ratio, as well as single design parameters is discussed as a function of the position of stability limit in the operating performance map, and the oscillatory frequency and amplitude. A modified model of the time lag theory was applied to the results and the system of unsteady equations has been derived from this. The stability limit is shown to be dependent on a critical time lag, and a correlating function was found which relates this magnitude directly to the predominant combustion variables. The results are summarized and discussed. Author ESRO)

N73-15806# Rocketdyne, Canoga Park, Calif.

STABILIZATION OF MHF-8 MONOPROPELLANT Final Report, 13 Sep. 1971 - 13 Jul. 1972

Arthur E. Axworthy and Ross I. Wagner Nov. 1972 75 p refs

(Contract F04611-72-C-0006; AF Proj. 3058)

(AD-750900; R-9048; AFRPL-TR-72-90) Avail: NTIS CSCL 21/9

Long-term storability and decomposition kinetics of monopropellant formulations containing hydrazine, hydrazine azide, and ammonia were investigated. These propellants were found to be incompatible with steel alloys but quite compatible with 2319 aluminum, 1100 aluminum, and Ti-6Al-4V. In addition, the nature of the decomposition mechanisms and the stoichiometries involved were investigated. Methods of improving the compatibility with stainless steels were tested. Author (GRA)

N73-15807# Bell Aerospace Co., Buffalo, N.Y.

PROPELLANT IMPROVEMENT PROGRAM. VOLUME 1, PART 1: COMPATIBILITY OF MATERIAL WITH STANDARD HIGH DENSITY ACIDS Special Technical Report, Mar. - Jun. 1972

Henry Ph. Heubusch Sep. 1972 61 p refs

(Contract F04611-72-C-0026; AF Proj. 3058)

(AD-749965; Rept-8643-928001-Vol-1-Pt-1; AFRPL-TR-72-77) Avail: NTIS CSCL 21/9

Sets of static, corrosion tests were performed to evaluate candidate materials being considered for use with standard HDA (High Density Acid), since the latter was known to be relatively corrosive. The tests were performed at temperatures and times representative of anticipated service conditions for each material. Measurements and observations were made both for changes in the acid and the material. This included chemical analyses and corrosion rates calculated from changes in weight. Based on the results, the materials were ranked in one of four categories,

ranging from satisfactory for general use to unsatisfactory. A number of aluminum alloys fell in the former category. Stainless steels appear good for limited use. Results for all materials are tabulated in the text. Author (GRA)

N73-15808# Yale Univ., New Haven, Conn. Dept. of Engineering and Applied Science.
INTERFACIAL CHEMICAL REACTIONS IN FLOW SYSTEMS Progress Report, 1 Dec. 1970 - 31 Jan. 1972
Daniel E. Rosner 31 Jan. 1972 5 p refs
(Contract F44620-70-C-0026; AF Proj. 9750)
(AD-750172; AFOSR-72-1957TR) Avail: NTIS CSCL 21/2

A summary is given of progress and research results obtained under the contract together with a listing of 11 publications resulting from the program. Areas included are nucleation in boundary layers, droplet evaporation and combustion, diffusion limited sphere growth/dissolution, apparent kinetics of surface reactions influenced by fluid phase or solid phase diffusion, dissolution of nitrogen in refractory metals, and aerosol production and dispersion downstream of oxidizing filaments. Author (GRA)

N73-15809# Hercules, Inc., Magna, Utah. Bacchus Works.
VELOCITY COUPLING ANALYSIS Phase 2 Technical Report, 1 Oct. 1971 - 30 Sep. 1972
M. Duane Horton (Brigham Young Univ.), Ralph L. Coates (Brigham Young Univ.), and Merrill W. Beckstead Oct. 1972 89 p refs
(Contracts F04611-72-C-0003; BYU-0104-03001)
(AD-750142; AFRPL-TR-72-106) Avail: NTIS CSCL 21/9

The report describes the results of a phenomenological study of the interaction between acoustic velocities and solid propellant combustion. The test apparatus used in the study was a T-burner, adapted to permit high speed cinemicrography coverage of a propellant test sample placed at the center of the T-burner where the acoustic velocity is at a maximum. A driver propellant (usally JPN) was used to provide a hot, oscillatory environment for the tests. Over 100 tests were performed with nine different propellant formulations. The frequency of oscillation, mean pressure, acoustic pressure amplitude, mean erosive velocity, and acoustic velocity were test variables. Author (GRA)

N73-15810# Army Foreign Science and Technology Center, Charlottesville, Va.
CONCISE DICTIONARY-HANDBOOK ON FUELS
K. F. Kushnirenko 21 Aug. 1972 706 p Transl. into ENGLISH of the book "Kratkii Slovar-Spravochnik po Goryuchemu" Moscow, 1971 167 p
(AD-750484; FSTC-HT-23-1019-72) Avail: NTIS CSCL 21/4

The dictionary-handbook contains short definitions for several of the most widely used terms concerning the transportation pumping, storage, quality control and use of fuels, lubricating materials, and special liquids. Illustrations and tables are used for clarification and fuller information. Tables dealing with properties and characteristics of materials, and technical specifications of items and equipment are given. Author (GRA)

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magneto-hydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N73-15811# Cranfield Inst. of Technology (England). School of Mechanical Engineering.
TURBOFAN PERFORMACE ASSESSMENT: A NEW METHOD OF ANALYSIS AND PRESENTATION
T. J. Corbishley and K. W. Ramsden May 1972 13 p refs
(CRANFIELD-SME-2) Avail: NTIS HC $3.00

The development of a method for assessing turbofan performance is discussed. The method introduces a dimensionless form for both thrust and specific fuel consumption. Each of the latter parameters are found to vary linearly with a new parameter, the in-pass ratio, over a wide range of typical engine operating conditions. The method is shown to facilitate, with little loss of accuracy, a savings in both computer time and graphical presentation. Author

N73-15812*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
APOLLO 12 MISSION REPORT: DESCENT, PROPULSION SYSTEM FINAL FLIGHT EVALUATION (SUPPLEMENT 5)
R. K. M. Seto and R. L. Barrows Sep. 1972 74 p refs Prepared by TRW Systems, Redondo Beach, Calif.
(Contract NAS9-8166)
(NASA-TM-X-68933; TRW-11176-H585-R0-00-Suppl-5; MSC-01855-Suppl-5) Avail: NTIS HC $5.75 CSCL 21H

The results are presented of the postflight analysis of the Descent Propulsion System (DPS) performance during the Apollo 12 Mission. The primary objective of the analysis was to determine the steady-state performance of the DPS during the descent phase of the manned lunar landing. This is a supplement to the Apollo 12 Mission Report. In addition to further analysis of the DPS, this report brings together information from other reports and memorandums analyzing specific anomalies and performance in order to present a comprehensive description of the DPS operation during the Apollo 12 Mission. Author

N73-15813*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
APOLLO 15 MISSION REPORT. SUPPLEMENT 3: ASCENT PROPULSION SYSTEM FINAL FLIGHT EVALUATION
W. G. Griffin Sep. 1972 51 p refs Prepared by TRW Systems, Redondo Beach, Calif.
(Contract NAS9-12330)
(NASA-TM-X-68932; TRW-20029-h062-r0-00; MSC-05161-Suppl-3) Avail: NTIS HC $4.75 CSCL 21H

Results from the postflight analysis of the ascent propulsion system (APS) performance during the Apollo 15 mission are presented. The duty cycle for the LM-10 APS consisted of two firings, an ascent stage liftoff from the lunar surface and the terminal phase ignition (TPI) burn. An evaluation was made of APS performance for the first firing and found to be satisfactory. No propulsion data was received from the second APS burn; however, all indications were that the burn was nominal. All performance parameters were well within their LM-10 3-sigma limits. Calculated throat erosion at engine cutoff for the LM-10 APS was approximately 3 percent greater than predicted. Author

N73-15814*# Rocketdyne, Canoga Park, Calif.
FLOX/MMH ROCKET ENGINE ASSEMBLIES Final Report, March 1972
Oct. 1972 81 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953206)
(NASA-CR-130288; R-8960) Avail: NTIS HC $6.25 CSCL 21H

A 6-month program was conducted to fabricate, acceptance test, and deliver to JPL two FLOX/MMH rocket engine assemblies. Acceptance testing consisted of injector cold flows and 15-second-duration hot firings with the engine assemblies. An additional objective of the program was to determine the feasibility of utilizing FLOX/MMH thrust chamber components with the F2/N2H4 propellant combination. Feasibility studies consisted of analysis, cold flow, and comparative F2/N2H4-FLOX/MMH calorimeter hot fire testing, followed by a 500-second duration F2/N2H4 demonstration test. Author

N73-15815*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CONTROL OF TURBOFAN LIFT ENGINES FOR VTOL AIRCRAFT
J. F. Sellers and J. R. Szuch 1973 24 p refs Proposed for Presentation at Ann. Gas Turbine Conf., Washington, D. C., 8-12 Apr. 1973; sponsored by ASME
(NASA-TM-X-68175; E-7259) Avail: NTIS HC $3.25 CSCL 21E

The use of turbofan engines as lift units for VTOL aircraft poses new engine control problems. At low flight speeds, the lift units must provide the fast thrust response needed for aircraft attitude and height control. The results are presented of an analytical study of the dynamics and control of turbofan lift engines, and methods are proposed for meeting the response requirements

imposed by the VTOL aircraft application. Two types of lift fan engines are discussed: the integral and remote. The integral engine is a conventional two-spool, high bypass ratio turbofan designed for low noise and short length. The remote engine employs a gas generator and a lift fan which are separated by a duct, and which need not be coaxial. For the integral engine, a control system design is presented which satisfies the VTOL response requirements. For the remote engine, two unconventional methods of control involving flow transfer between lift units are discussed. Both methods are showh to have thrust response near the required levels. Author

N73-15816*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROPULSION SYSTEM FOR RESEARCH VTOL TRANSPORTS
Laurence W. Gertsma and Steve Zigan 1973 24 p refs Proposed for presentation at Gas Turbine Conf., Washington, D. C., 8-12 Apr. 1973; sponsored by ASME
(NASA-TM-X-68168; E-7228) Avail: NTIS HC $3.25 CSCL 21E

In anticipation of an eventual VTOL requirement for civil aviation, NASA has been conducting studies directed toward determining and developing the technology required for a commercial VTOL transport. In this paper, the commercial transport configurations are briefly reviewed; the propulsion system specifications and components developed by the engine study contractor are presented and described; and methods for using the lift-propulsion system for aircraft attitude control are discussed. Author

N73-15817*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF INTEGRAL LIFT-FAN ENGINE DYNAMICS
John R. Szuch Washington Jan. 1973 52 p refs
(NASA-TM-X-2691; E-7079) Avail: NTIS HC $3.00 CSCL 21E

An integral lift-fan engine being considered for VTOL applications was simulated using the hybrid computer. A contractor-proposed fuel control and a simple model of the roll dynamics of a hovering VTOL airplane were used in the simulation. Both steady-state and transient data were generated. The desired engine time constant of 0.20 second was achieved for thrust increments less than 10 precent of the design thrust. For roll angle demands less than 10 deg, roll angle overshoot was acceptable with more than 84 percent of the demand achieved in 1 second. Author

N73-15818*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COLD-AIR AERODYNAMIC STUDY IN A TWO-DIMENSIONAL CASCADE OF A TURBINE STATOR BLADE WITH SUCTION-SURFACE FILM COOLING
Douglas B. Brown and Ronald M. Helon Washington Jan. 1973 31 p refs
(NASA-TM-X-2685) Avail: NTIS HC $3.00 CSCL 21E

The effect on aerodynamic performance of a single row of spanwise-spaced coolant holes located at four positions chordwise along the suction surface was investigated. In addition, multiple-row data were obtained. The data are presented in terms of primary efficiency, coolant-to-primary-flow percentage, and coolant pressure ratio. Primary efficiencies of multirow blade configurations compare satisfactorily with that calculated from the single-row efficiency increments. At any given coolant flow percentage, the efficiency was about the same for all row locations. For a given coolant pressure, the efficiency varied by as much as 1 percent, depending on the row location. Author

N73-15819# National Aerospace Lab., Tokyo (Japan).
LINER COOLING OF THE AERONAUTICAL GAS TURBINE COMBUSTOR
Tetsuro Aiba Aug. 1972 25 p refs In JAPANESE; ENGLISH summary
(NAL-TR-196) Avail: NTIS HC $3.25

The problems of flame radiation, liner temperature, and film cooling in a gas turbine combuster are discussed. Flame radiation was treated as a radiosity problem using gas temperature, gray gas, and several isothermal surfaces as references. Liner temperature was calculated fcr an annular type combuster from the balance of flame radiation and cooling heat flux given by convective and film cooling. The film cooling for the combuster was analyzed on the basis of the length of potential core given directly after the cooling slot. Author

N73-15820# National Aerospace Lab., Tokyo (Japan).
REAL-TIME SIMULATION OF JET ENGINES WITH DIGITAL COMPUTER. 1: FABRICATION AND CHARACTERISTICS OF THE SIMULATOR
Kenji Nishio, Nanahisa Sugiyama, Takeshi Koshinuma, Takeo Hashimoto, Toshimi Ohhata, and Hideo Ichikawa Jul. 1972 37 p refs In JAPANESE; ENGLISH summary
(NAL-TR-283) Avail: NTIS HC $4.00

The fabrication and performance of a real-time jet engine simulator using a digital computer are discussed. The use of the simulator in developing the components and control systems of a jet engine is described. Comparison of data from jet engine simulation tests with actual engine tests was conducted with good agreement. Author

N73-15821*# Boeing Co., Seattle, Wash.
DESIGN OF A BLEED SYSTEM FOR A MACH 3.5 INLET
J. Syberg and T. E. Hickcox Washington NASA Jan. 1973 91 p refs
(Contract NAS2-6643)
(NASA-CR-2187; D6-60168) Avail: NTIS HC $3.00 CSCL 21E

An analytical bleed system design procedure is applied to a Mach 3.5, axisymmetric, translating centerbody inlet. The design features a traveling centerbody bleed system with a ducting arrangement separating low-, medium-, and high-pressure bleed. Three forward plenums and nine throat plenums are installed on the centerbody to meet the bleed requirements in the started Mach range between 1.6 and 3.5. The cowl contains four stationary plenums, three for forward and one for throat bleed. To achieve maximum bleed plenum pressure and thereby minimize bleed drag all bleed holes are inclined 20 deg to the surface except in the cowl throat region. Here the requirement of high stability margin with minimum total pressure recovery penalty resulted in 90 deg bleed holes. The bleed hole diameter varies from bleed plenum to bleed plenum to achieve the most efficient boundary layer control, while the bleed exits are sized to operate at the highest possible plenum pressure without unchoking the bleed holes. Bleed flow rates, bleed plenum pressures, and boundary layer development along the cowl and centerbody are predicted over the entire started Mach range. Author

N73-15822*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTERNAL PERFORMANCE OF A WEDGE NOZZLE FOR A SUPERSONIC CRUISE AIRCRAFT WITH A MULTISPOKE PRIMARY FOR NOISE SUPPRESSION
Albert L Johns Washington Jan. 1973 45 p refs
(NASA-TM-X-2689; E-7051) Avail: NTIS HC $3.00 CSCL 12D

Nozzle performance was obtained with cold primary and secondary flows over a range of nozzle pressure ratio from 2 to 31 and corrected secondary-to primary-flow ratio from 0 to 11 percent. Several fixed shroud positions were tested to simulate a translating outer cylindrical shroud to provide data for both supersonic cruise and takeoff configurations. The addition of 14 spokes in the primary nozzle for noise suppression reduced the thrust efficiency 3 percent at supersonic cruise and 4.5 percent at takeoff. Author

N73-15823# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
DEVELOPMENT OF PULSABLE ATTITUDE CONTROL ENGINES FOR HYDROGEN AND OXYGEN [ENTWICKLUNG PULSFAEHIGER LAGEREGELUNGSTRIEBWERKE FUER WASSERSTOFF, SAUERSTOFF]
Guenther Pulkert 1972 19 p In GERMAN Presented at the 5th DGLR Ann. Meeting, Berlin, 4-6 Oct. 1972
(MBB-UR-158-72-O; DGLR-Paper-72-77) Avail: NTIS HC $3.00

Two hydrogen-oxygen engines have been developed for space

shuttle attitude control, and stationary or pulsed operation. The main characteristics of combustion chamber, injector head, spark igniter, and pulse valve, are described. Engine tests have led to the following results: the engines can be manually operated either stationary or with a pulse frequency up to 10 Hz; the test duration is not limited, even for a partial loading of the engine, average combustion efficiency is 98%, for the second version fatigue life is about 1000 stress cycles, and combustion chamber linings are made of copper-zirconium-silver. Author (ESRO)

N73-15824# Ford Foundation, New York.
DEVELOPMENT AND QUALIFICATION RESULTS OF THE MONOPROPELLANT SYSTEM FOR THE AEROS AERONOMY SATELLITE [ENTWICKLUNGS- UND QUALIFIKATIONSERGEBNISSE DES MONERGOLEN ANTRIEBSSYSTEMS FUER DEN AERONOMIESATELLITEN AEROS]
E. Schneider 1972 51 p In GERMAN Presented at the 5th DGLR Ann. Meeting, Berlin, 4-6 Oct. 1972 Sponsored by Bundesmin. fuer Bildung und Wiss.
(DGLR-Paper-72-79) Avail: NTIS HC $4.75

The design and qualification testing of a hydrazine engine for attitude control of the Aeros satellite is reported.
Author (ESRO)

N73-15825# Entwicklungsring Nord, Bremen (West Germany).
PROGRESSIVE HYDRAZINE ATTITUDE AND ORBIT CORRECTION. PROPULSION SYSTEMS AND THEIR APPLICATION IN EUROPE [FORTSCHRITTLICHE HYDRAZIN-LAGE- UND BAHN-KORREKTUR. ANTRIEBSSYSTEME UND IHRE ANWENDUNG IN EUROPA]
H.-D. Schmitz and H. Woidneck Oct. 1972 33 p In GERMAN Presented at the 5th DGLR Ann. Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-78) Avail: NTIS HC $3.75

Hydrazine engines for satellite attitude control are described and their possible applications to the European Aerosat and ECS satellites are discussed. It is shown that the main problem in catalytic hydrazine engine application to attitude control is the cold start characteristics. As a result of this, two new hydrazine engine concepts have been developed: a pressurized gas system using a gas generator, and an electrothermal system using resistojets. These engines are compared with conventional systems. Author (ESRO)

N73-15826# Deutsche Gesellschaft fuer Luft- und Raumfahrt, Cologne (West Germany).
INVESTIGATION OF THE SPACE WORTHINESS OF THE ESKA 18 ELECTRIC PROPULSION SYSTEM [UNTERSUCHUNG DER RAUMFAHRTTAUGLICHKEIT DES ELEKTRISCHEN TRIEBWERKS ESKA 18]
Winfried Selke 1972 28 p refs In GERMAN Presented at the 5th DGLR Ann. Meeting, Berlin, 4-6 Oct. 1972 Sponsored by Bundesmin. fuer Bildung ind Wiss.
(DGLR-Paper-72-87) Avail: NTIS $3.50

Vibration, functional, and electronic equipment tests were carried out with a prototype of the ESKA 18 electrostatic ion engine. Small, but effective, modifications were introduced to withstand vibration loads. Functional tests before and after the vibration tests have shown that the vibration loads during the launching of the vehicle should not impair proper functioning of the engine. Constructive modifications are proposed for further development of the engine. The associated electronic equipment is described and results of the first functional tests are presented. Author (ESRO)

N73-15827# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
ADVANCED PROPULSION CONCEPTS: PROJECT OUTGROWTH Survey Report, 1 Jan. - 31 Dec. 1970
Franklin B. Mead, Jr. Jun. 1972 278 p refs
(AD-750554; AFRPL-TR-72-31) Avail: NTIS CSCL 21/8

A study was conducted by an ad hoc group within the Air Force Rocket Propulsion Laboratory during the calendar year of 1970 in an attempt to predict the major propulsion developments that may occur in the next 30 to 40 years. The report evaluates the future of conventional chemical rocketry based on thermodynamic principles and revolutionary conceptual approaches to system applications. Advanced concepts falling under the general headings of Thermal, Field and Photon Propulsion are evaluated to a degree necessary to define their potential. The report does not define a long list of very near-term technology program subjects, but is designed to encourage and motivate talented and interested scientists and engineers to once again strive for advanced propulsion concepts. Author (GRA)

N73-15828# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE CONNECTION OF THE INVARIANCE CONDITIONS WITH THE CHARACTERISTICS OF A TURBOJET ENGINE WITH AFTERBURNER MULTIDIMENSIONAL CONTROL SYSTEM
V. A. Bodner and Yu. A. Ryazanov 25 Aug. 1972 17 p refs Transl. into ENGLISH from the publ. "Primeniye Invariantnykh Sistem Avtomaticheskogo Upravleniya" Moscow Nauka, 1970 p 310-317
(AD-749656; FTD-MT-24-1086-72) Avail: NTIS CSCL 21/5

The purpose of the work is the establishment of the connection of invariance conditions with the characteristics of a turbojet engine with afterburner multidimensional control system under variable flight conditions with the use of methods of synthesizing the characteristics by approximating the transfer functions.
Author (GRA)

N73-15829# United Technology Center, Sunnyvale, Calif.
MEASUREMENT OF ROCKET NOZZLE SURFACE RECESSION USING SPECTROGRAPHIC TECHNIQUES Final Report, 15 Mar. 1971 - 31 Jul. 1972
Wendell A. Stephen and Thomas E. Frakes Oct. 1972 59 p refs
(Contract F04611-71-C-0041)
(AD-749968; UTC-2405-FR; AFRPL-TR-72-91) Avail: NTIS CSCL 21/8

The objective of the program was to design, analyze, and evaluate experimentally the surface recession of ablative materials using spectrographic techniques. In the first phase the design, analysis, and development of a containment system for the tracer elements were conducted. The second phase was the demonstration of the feasibility of that system during static firings in two rocket nozzles, one fabricated from carbon-phenolic and the other from silica-phenolic with a codeposited silicon carbide/pyrolytic-graphite throat insert. Laboratory tests were conducted with a plasma-arc torch to verify the capsule design. The report describes the various program activities from initial tracer selection and configuration selection to final test firing demonstration and analysis of test results. GRA

N73-15830# Army Missile Command, Redstone Arsenal, Ala. Propulsion Directorate.
COMPARISON OF PERFORMANCE OF A DOUBLE-CORNERED PLUG NOZZLE WITH A CONVENTIONAL CONVERGENT-DIVERGENT ROCKET NOZZLE
Arnold T. Stokes 30 Jun. 1972 46 p
(DA Proj. 1M2-62303-A-214)
(AD-750591; RK-TR-72-17) Avail: NTIS CSCL 21/8

The report presents performance data for double-cornered plug nozzles for comparison with convergent-divergent nozzles. A conventional convergent-divergent (C-D) nozzle was used to develop the propellant charge, ignition and ballistics, and as a baseline for plug nozzle performance evaluation. Author (GRA)

N73-15831# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
CYCLE TESTING OF ACS VALVES IN ClF5 Final Report, Apr. 1970 - Jun. 1972
Garreth J. Gunderson Aug. 1972 112 p refs
(AD-750873; AFRPL-TR-72-82) Avail: NTIS CSCL 21/8

The report documents the complete test program conducted to establish a seat and poppet material(s) for use in chlorine pentafluoride (ClF5) attitude control system (ACS) valves. Test results of iron, nickel, tungsten, boron and zirconium based materials in the flat-on-flat sealing concept are discussed. Additionally, a sapphire/copper lip-seal concept and thin coatings of aluminum, tungsten and chromium on substrates, previously

proved to be incompatible, were evaluated. In the tests conducted under this program, two carbides of tungsten and one of boron have successfully met the helium leakage requirement after 100,000 actuations in the ClF5 environment. Author (GRA)

N73-15832# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROPELLANT VALVES OF LIQUID PROPELLANT ROCKET ENGINES
A. I. Edelman 29 Jun. 1972 375 p refs Transl. into ENGLISH of the book "Toplivn. Klapany Zhidkostnykh Raketnykh Dvigatelei" Moscow, 1970 p 1-244
(AD-750578; FTD-MT-24-1463-71) Avail: NTIS CSCL 21/8

The book deals with problems in design and finish-off of automatic fuel units of liquid propellant rocket engines, specifications for these units and methods for their achievement. Analyzed are the effects of various factors on performance and reliability of units, as well as a series of standard designs of fuel valves. Given are testing methods, calculation principles and operating regulation of units. The book was written for specialists working in the field of design and operation of liquid-propellant rocket engines and their units. Author (GRA)

N73-15833# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DUCTED-FAN TURBOJET ENGINES: REVIEW OF DEVELOPMENT ON FOREIGN PUBLICATIONS
L. N. Golub 29 Aug. 1972 20 p refs Transl. into ENGLISH from Tr. Riiga, Nauch.-Tekh. Sb. Trudov po Prikl. Gazotermodinam. (USSR), no. 89, 1966 p 115-127
(AD-750984; FTD-HC-23-813-72) Avail: NTIS CSCL 21/5

The author analyzes operating principles and the thermodynamic cycle of turbofan rocket engines. Given is a brief analysis of the present state of turbofan rocket engines abroad, an analysis of design characteristics of a series of power plants, and basic diagrams of engines, their merits and shortcomings. Indicated are also the advantages of turbofan rocket engines at high supersonic-flight M numbers in comparison with other types of engines, as well as the possible field of application of turbofan rocket engines. Author (GRA)

N73-15834# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CONTROLLING THE BOUNDARY LAYER IN HYPERSONIC AIR INTAKES
D. A. Gorodnikov, V. T. Grin, and N. N. Zakharov 28 Jul. 1972 15 p Transl. into ENGLISH from the publ. "1st International Symposium on Air-Breathing Engines" Marseille, France, 19-23 Jun. 1972 p 1-8
(AD-750513; FTD-HT-23-1349-72) Avail: NTIS CSCL 21/5

An increase in the Mach number of airborne vehicles using airbreathing jet engines leads to a substantial decrease in the performance of the air intakes used in these engines. The main reason for the deterioration in performance is an increase in the influence of air viscosity. Despite the fact that the Mach number following compression in a hypersonic air intake intended for engines with supersonic combustion is greater than 1, the pressure ratio in it reaches p = 100 and higher. In principle, such a pressure ratio can be obtained in a system of weak compression shocks with relatively low levels of total-pressure losses. However, the realization of such compression involves the occurrence of separation of the boundary layer. To prevent separation of the boundary layer a system for controlling the boundary layer must be devised. Author (GRA)

N73-15835# California Univ., Berkeley. Dept. of Mechanical Engineering.
NONEQUILIBRIUM COMBUSTION PRODUCTS FOR CALCULATING ROCKET ENGINE PERFORMANCE Final Report, 1 Jan. 1967 - 31 Dec. 1971
Robert F. Sawyer Sep. 1972 13 p refs
(Grant AF-AFOSR-1256-67)
(AD-750169; ME-72-2; AFOSR-72-1958TR) Avail: NTIS CSCL 21/8

The report is a summary and review of research on nonequilibrium combustion products for calculating rocket engine performance. The research concerned the chemical kinetics of combustion processes, the resulting nonequilibrium combustion products, and the effect of nonequilibrium combustion products on theoretical rocket engine performance. Author (GRA)

N73-15836# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE USE OF MIXED GASES AS THE WORKING BODIES OF CLOSED GAS TURBINE INSTALLATIONS
S. D. Tetelbaum and A. M. Klok 18 Aug. 1972 16 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Energ. (USSR), no. 4, 1971 p 62-67
(AD-750905; FTD-MT-24-1883-71) Avail: NTIS CSCL 21/5

The addition of helium to various gases utilized as working bodies of closed gas turbine installations allows for a decrease of the value of heat exchange surfaces. The efficiency in this case falls considerably less than with an increase in the temperature pressure heads. The use as working bodies of mixtures of some gases with helium and hydrogen which, in principle will make it possible to create a closed gas turbine installation which will simultaneously have a higher efficiency and a lower value of sizes of heat exchange surfaces than when using pure gases, is advisable. Author (GRA)

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also: 13 Geophysics, and 24 Physics, Atomic, Molecular, and Nuclear.

N73-15837*# California Inst. of Tech., Pasadena.
A QUANTITATIVE INVESTIGATION OF THE SOLAR MODULATION OF COSMIC-RAY PROTONS AND HELIUM NUCLEI Ph.D. Thesis
Thomas Lee Garrard 19 Jun. 1972 233 p refs
(Contract NAS5-9312; Grant NGR-05-002-160)
(NASA-CR-130298) Avail: NTIS HC $13.75 CSCL 03B

The differential energy spectra of cosmic ray protons and He nuclei were measured at energies up to 315 MeV/nucleon using balloon-borne and satellite-borne instruments. These spectra are presented for solar quiet times for the years 1966 through 1970. The data analysis is verified by extensive accelerator calibrations of the detector systems and by calculations and measurements of the production of secondary protons in the atmosphere. The spectra of protons and He nuclei in this energy range are dominated by the solar modulation of the local interstellar spectra. Numerical solutions to the transport equation are presented for a wide range of parameters. Author

N73-15838# Academy of Sciences (USSR), Moscow.
EXPERIMENTS WITH ARTIFICIAL SOLAR WIND
I. M. Podgorny, E. M. Dubinin, and G. G. Managadze 1970 50 p refs In ENGLISH and RUSSIAN
(D-15) Avail: NTIS HC $4.50

A laboratory experiment simulating the interaction of the solar wind with the earth's magnetic field is described. The emphasis was on simulated magnetosphere measurements at the shock wave front, including microfluctuations and field configuration on the nocturnal side. The shock wave in the vicinity of the head-point and magnetic field changes along the axis parallel to the velocity were also investigated. N.E.N.

N73-15839# Joint Publications Research Service, Arlington, Va.
INTERKOSMOS SATELLITES STUDY COSMIC RAYS
N. L. Grigorov and P. V. Vakulov 5 Jan. 1973 19 p refs Transl. into ENGLISH of Priroda (Moscow), no. 10, 1972
(JPRS-57913) Avail: NTIS HC $3.00 CSCL 03B

Cosmic ray studies conducted with the Intercosmos satellites are reviewed. Author

N73-15840*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HIGH RESOLUTION POWER SPECTRA OF DAILY ZURICH SUNSPOT NUMBERS
Harold C. Euler, Jr. 18 Jan. 1973 23 p refs
(NASA-TM-X-64718) Avail: NTIS HC $3.25 CSCL 03B

High resolution power spectra of 77 years of Zurich daily sunspot numbers were computed using various lags and data point intervals. Major harmonic peaks of the approximately 124-month period showed up strongly as well as the 27-day solar rotational period. Author

N73-15841*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COSMIC RAY SOURCES: EVIDENCE FOR TWO ACCELERATION MECHANISMS
R. Ramaty, V. K. Balasubrahmanyan, and J. F. Ormes Dec. 1972 15 p refs Submitted for publication
(NASA-TM-X-66149; X-661-72-479) Avail: NTIS HC $3.00 CSCL 03B

The difference between the spectra of iron and other cosmic rays is interpreted in terms of two source mechanisms. One mechanism, possibly acceleration at neutron star surfaces, produces the iron and another is responsible for the rest of the primary nuclei. Within this model, high energy observations could determine whether secondary nuclei are produced in the sources or in the interstellar medium. Author

N73-15842# Royal Inst. of Tech., Stockholm (Sweden).
SHOCK-FREE SOLUTIONS OF SOLAR WIND: COMETARY PLASMA FLOWS?
Max Wallis Apr. 1972 32 p refs Submitted for publication Prepared in cooperation with Liege Univ., Belgium
(TRITA-EPP-71-33) Avail: AEC Depository Libraries

The quasi-one-dimensional formulation of the MHD equations is used to describe the ionizing flow in the solar wind's passage through a cometary coma. A set of ordinary differential equations describes the flow along the central stream-tube. The nature of the critical (magnetosonic) point is examined for spatial variations R to the minus nth power in the ionization rates; the point is a node with shock-free solutions only for locally low gradients, or for interactions with strong cooling. Otherwise, for realistic values n approximately equal to 2, the critical point is a focus and weakly shocked solutions are appropriate. However, in the external field of laboratory simulation experiments, the critical point disappears and the flow is, in any case, shock-free.
Author (NSA)

N73-15843# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
AN OBJECTIVE BASELINE FOR FLARE PREDICTION
Environmental Research Papers
Ronald T. Podsiadlo 14 Jul. 1972 13 p refs
(AF Proj. 8666)
(AD-749869; AFCRL-72-0414; AFCRL-ERP-405) Avail: NTIS CSCL 03/2

The relationship between various measurable solar parameters and solar-flare occurrence is examined utilizing a comprehensive solar-geophysical data base containing a variety of objectively-correlated solar measurements. The sample covers the period from January 1955 through February 1968 and includes such parameters as solar flares, sunspots, magnetic fields of sunspots, calcium plages and 9.1 cm radio brightness temperatures. A statistical analysis was performed to determine the parameters most useful for the prediction of solar flares 24 hours in advance. Persistence was identified as the single most important flare predictor, with sunspot magnetic classification, 9.1 cm radio brightness temperature, plage brightness and sunspot area also selected as useful predictors. Objective flare probability prediction equations were developed that incorporate all useful predictors simultaneously. Author (GRA)

N73-15844# Naval Intelligence Support Center, Washington, D.C.
DIURNAL VARIATION OF COSMIC RAYS IN 1962 AND IN 1964-1965
A. K. Pankratov 29 Sep. 1972 16 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR Krymsk. Astrofiz. Observ. (USSR), v. 41/42, 1970 p 230-239
(AD-750870; NISC-TRANS-3349) Avail: NTIS CSCL 04/1

The diurnal variation amplitude and phase data both of the cosmic-ray neutron component for the periods of August-December 1962, 1964-1965 and the hard component for the period of January 1964-April 1965 were obtained. The qualitative analysis of these data as well as the same data for the period of the IGY and underground measurement data shows that during the minimum sunspot activity the significant changes of the configuration of cosmic-ray modulation region take place in the direction of high helio-latitudes. Author (GRA)

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N73-15845 National Lending Library for Science and Technology, Boston Spa (England).
THE GIANT PLANETS
V. G. Tejfel [1972] 19 p refs Transl. into ENGLISH from Vestn. Akad. Nauk SSSR, Astron. (Moscow), v. 4, 1970 p 81-95
(NLL-M-20702-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

Ground-based optical studies of the outer planets, their results, and problems involved are briefly surveyed. These include the atmospheric compositions and structures, atmospheric temperature, aerosol layers, and optical properties of the atmospheres. The emphasis is on Jupiter's atmosphere, followed by data on Saturn's atmosphere. N.E.N.

N73-15846 Edinburgh Univ. (Scotland). Dept. of Astronomy.
PHOTOGRAPHIC R MAGNITUDES OF 228 STARS IN ORION
M. T. Brueck 1972 11 p refs Repr. from Publ. of the Roy. Obs. (Edinburgh), v. 7, no. 7, 1972 p 85-92
Copyright. Avail: Issuing Activity

Photographic R magnitudes down to R = 13.5 m were measured for stars in the Orion I association. Combined with V magnitudes of the same stars taken from Walker's observations they allow the lower end of the color magnitude diagram (V against (V-R)) to be drawn. The position of the majority of stars on this diagram is intended to be used as a basis for comparisons of the photometric characteristics of T Tauri stars and similar objects. Author

N73-15847 Edinburgh Univ. (Scotland). Dept. of Astronomy.
PHOTOGRAPHIC PHOTOMETRY OF T TAURI STARS AND RELATED OBJECTS IN ORION
M. T. Brueck 1972 14 p refs Repr. from Publ. of the Roy. Obs. (Edinburgh), v. 7, no. 8, 1972 p 93-106
Copyright. Avail: Issuing Activity

The determinations of photographic V and R magnitudes are completed of 130 T Tauri and H alpha emission stars in Orion I down to R = 13.8; photographic B and U magnitudes were also observed in some cases. By comparison with normal stars in the association, 9 of the stars are shown to have colour anomalies. Variability is found to be greater in V than in R, and interstellar extinction is also heavier for these stars than for the normal field. Where luminosities can be computed, results suggest that the stars are more luminous and younger than the normal stars in the field. Author

N73-15848*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
UNDERLUMINOSITY AND MAGNETIC FIELDS IN BETA LYRAE
R. Stothers [1972] 14 p refs
(NASA-TM-X-68895) Avail: NTIS HC $3.00 CSCL 03B

A combination of available observational data for Beta Lyrae and theoretical models of evolution in close binary systems in used to show that the minimum underluminosity of the dark secondary component of this system is 1 to 4 mag. It is demonstrated that magnetic fields are probably relatively weak in massive main-sequence stars, including the two stellar components of Beta Lyrae, and therefore that a strong magnetic field is not a likely explanation for the underluminosity of the secondary component of Beta Lyrae. Author

N73-15849*# Boeing Co., Seattle, Wash. Space Sciences Group.
JOVIAN SATELLITE ECLIPSE STUDY 2: 1972 ECLIPSE DATA Final Report
T. F. Greene and R. W. Shorthill Oct. 1972 287 p refs
(Contract NASw-2390)
(NASA-CR-130292; D180-15151-1) Avail: NTIS HC $16.50 CSCL 03A

The Jove satellite eclipse observations performed on 6 April, 8 May, and 13 May, 1972 with the 200-inch Hale Telescope are reported. Spectrograms, and multichannel spectrometer data are included. F.O.S.

N73-15850*# California Inst. of Tech., Pasadena.
DEVELOPMENT OF PERFORMANCE CRITERIA FOR ADVANCED VIKING SEISMIC EXPERIMENTS Final Report
31 Aug. 1972 45 p
(Grant NGR-05-002-249)
(NASA-CR-130358) Avail: NTIS HC $4.25 CSCL 03B

The characteristics and requirements of the seismic instrument for mapping the internal structure of the planet Mars are briefly described. The types of signals expected to exist are microseismic background generated by wind and pressure variations and thermal effects, disturbances of or in the landed vehicle, signals caused by faulting and volcanic activity, and signals due to meteoritic impacts. The advanced instrument package should include a short-period vertical component system, a long-period or wide-band 3-component system, a high frequency vertical component system, and a system for detection and rejection of lander noises. The Viking '75, Surveyor, and Apollo systems are briefly described as potential instruments to be considered for modification. Data processing and control systems are also summarized. N.E.N.

N73-15851# Chile Univ., Santiago. Dept. of Astronomy.
A SOUTHERN OBJECTIVE PRISM SURVEY
J. Stock and H. Wroblewski Oct. 1971 73 p refs *Its* Dept. de Astron. Publ., Vol. 2, No. 3
Avail: NTIS HC $5.75

An objective prism survey intended to cover the entire southern sky within the magnitude range from the 10th to the 13th photographic magnitude is described. The survey includes luminous stars, planetary nebulae, Me-stars, carbon stars, and other objects of interest. The first five sections of the survey, covering an area of approximately 4000 square degrees are completed. The spectral types, magnitudes, and positions for the objects of interest are given in five separate catalogs. Author

N73-15852# Universidad Nacional de Colombia, Bogota.
ANNUAL OF THE NATIONAL ASTRONOMICAL OBSERVATORY FOR 1972 [ANUARIO DEL OBSERVATORIO ASTRONOMICO NACIONAL 1972]
1972 112 p In SPANISH
Avail: NTIS HC 7.75

The astronomical catalog for 1972 is presented. Data included are: solar and lunar eclipses; time conversion tables; ephemerides for the sun, moon, stars, and planets; and position of selected navigational stars. Transl. by F.O.S.

N73-15853# Universidad Nacional de Cordoba (Argentina). Observatorio Astronomico.
ANNULAR ECLIPSE OF THE SUN FOR 4 JANUARY 1973 [ECLIPSE ANULAR OF SOL DEL 4 DE ENERO DE 1973]
Gualberto M. Tannini and Arcadio Niell 1972 22 p In SPANISH
Avail: NTIS HC $3.25

The solar eclipse of 4 January 1973, which reaches maximum eclipse at mid-day, and will be visible as a partial eclipse in all of Argentina is described. The major cities in South America, from which the eclipse will be visible are listed with the time for the beginning, maximum, and end of the eclipse. Maps with curves which indicate the times for the beginning and ending of the partial eclipse are included with a map showing the zone of total eclipse. Transl. by F.O.S.

N73-15854# Academy of Sciences (USSR), Moscow.
ON THE NATURE OF QUASARS AND NUCLEI OF SEIFERT GALAXIES
I. S. Shklovsky 15 Jan. 1972 56 p refs In ENGLISH and RUSSIAN
(NP-30) Avail: NTIS HC $5.00

The formation of relativistic particles into clouds in nuclei of quasars and Seifert galaxies is investigated. The radio emission from N-galaxy 14m3C120 at early stages of cloud expansion was analyzed using data taken simultaneously at 2, 6, 11, and 40 cm. It is felt that at an early stage of the cloud evolution, after the rate of injection had begun to decrease, the transformation of the original spectrum of relativistic electrons occurred during a relatively short time period. The submillimeter emission from quasars and Seifert's nuclei is studied and is described by a dynamic spectrum. The nature of outbursts and the possibility of observing powerful flares of gamma rays from quasars and Seifert's nuclei are also considered. It is concluded that the main part of quasar and Seifert nuclei energy is radiated not in the submillimeter wavelength but in the gamma-wavelength. The expected power of quasar gamma emission is 3 times 10 to the 47th power erg/sec. N.E.N.

N73-15855*# Martin Marietta Corp., Baltimore, Md. Corporate Research and Development Lab.
MERCURY CONTAMINATION STUDY FOR FLIGHT SYSTEM SAFETY Final Report
C. S. Gorzynski, Jr. and J. N. Maycock Oct. 1972 49 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953519)
(NASA-CR-130286; RIAS-TR-72-18C) Avail: NTIS HC $4.50 CSCL 22A

The effects and prevention of possible mercury pollution from the failure of solar electric propulsion spacecraft using mercury propellant were studied from tankage loading of post launch trajectory injection. During preflight operations and initial flight mode there is little danger of mercury pollution if proper safety precautions are taken. Any spillage on the loading, mating, transportation, or launch pad areas is obvious and can be removed by vacuum cleaning soil and chemical fixing. Mercury spilled on Cape Kennedy ground soil will be chemically complexed and retained by the sandstone subsoil. A cover layer of sand or gravel on spilled mercury which has settled to the bottom of a water body adjacent to the system operation will control and eliminate the formation of toxic organic mercurials. Mercury released into the earth's atmosphere through leakage of a fireball will be diffused to low concentration levels. However, gas phase reactions of mercury with ozone could cause a local ozone depletion and result in serious ecological hazards. Author

N73-15856# Joint Publications Research Service, Arlington, Va.
SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 291
27 Dec. 1972 49 p refs Transl. into ENGLISH from various Soviet bloc publications
(JPRS-57858) Avail: NTIS HC $4.50

Translations and abstracts are presented of articles on meteorology, oceanography, upper atmosphere and space research, astronomy and terrestrial geophysics, covering both science news and formal scientific reports. Author

N73-15857# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON THE DEPENDENCE OF THE MAGNETOPAUSE LOCATION ON THE ORIENTATION OF THE INTERPLANETARY MAGNETIC FIELD
M. S. Kovner [1972] 4 p refs Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow), v. 12, no. 5, 1972 p 947-949
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Hydromagnetic properties of the observed magnetosphere shift southward are discussed. Explorer 35 and OGO 5 data indicate a magnetopause shift of a distance greater than two earth radii within the daytime side in approximately 2 hours. Mathematical expressions are presented describing the turbulent flow in the transition domain. The positions of the magnetosphere boundary are considered for two cases: no regular magnetic field in the transition domain, and a magnetic field of southerly direction in the transition domain. N.E.N.

N73-15858*# URS/Matrix Co., Huntsville, Ala.
EXTRAVEHICULAR ACTIVITIES GUIDELINES AND DESIGN CRITERIA
Nelson E. Brown, Thomas R. Dashner, and Benita C. Hayes Washington NASA Jan. 1973 574 p refs
(Contract NAS8-27502)
(NASA-CR-2160; M601) Avail: NTIS HC $6.00 CSCL 22A

A listing of astronaut EVA support systems and equipment, and the physical, operational, and performance characteristics of each major system are presented. An overview of the major ground based support operations necessary in the development and verification of orbital EVA systems is included. The performance and biomedical characteristics of man in the orbital EV environment are discussed. Major factors affecting astronaut EV work performance are identified and delineated as they relate to EV support systems design. Data concerning the medical and physiological aspects of spaceflight on man are included. The document concludes with an extensive bibliography, and a series of appendices which expand on some of the information presented in the main body. Author

N73-15859*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SINGLE THRUST PERIOD MISSIONS TO URANUS FOR UNMANNED NUCLEAR-ELECTRIC PROPULSION SYSTEMS
Charles L. Zola Washington Jan. 1973 36 p refs
(NASA-TN-D-7125; E-6839) Avail: NTIS HC $3.00 CSCL 22A

The effects of trip time, propulsion time, and specific powerplant mass are studied for optimized unmanned probe spacecraft on missions to Uranus with nuclear-electric propulsion systems. Electric propulsion is confined to a single thrust period at the beginning of each mission. Mission profiles include both high-thrust and electric-propulsion Earth-departure modes for planet flyby and orbital capture. Effects of propulsion time and propulsion system parameters are evaluated, and typical design features of the nuclear-electric spacecraft are outlined. Payload capability comparisons are made with systems employing ballistic transfer and solar-electric propulsion. Author

N73-15860*# California Univ., Los Angeles. Dept. of Planetary and Space Science.
TOPOLOGY OF INDUCED LUNAR MAGNETIC FIELDS
Kenneth Schwartz and G. Schubert [1973] 37 p refs
(Contract NAS2-6876)
(NASA-CR-114545) Avail: NTIS HC $4.00 CSCL 03B

Using the asymmetric theory of lunar induction the total and induced magnetic field line structure within the Moon and the diamagnetic cavity were obtained. Total field distributions are shown for orientations of the oscillating interplanetary field parallel, perpendicular and at 45 deg to the cavity axis. Induced field lines are shown only for the orientations of the interplanetary field parallel and orthogonal to the cavity axis. When compared with the field lines derived using the long wavelength limit of spherically symmetric vacuum induction theory, the configurations obtained using the asymmetric theory exhibit significant distortion. For all orientations of the interplanetary field, the field lines are strongly compressed on the sunlit hemisphere because of the confining solar wind pressure at the lunar surface and the exclusion of the field by the lunar core. Author

N73-15861*# California Univ., Los Angeles. Dept. of Planetary and Space Science.
LUNAR ELECTROMAGNETIC SCATTERING. 1: PROPAGATION PARALLEL TO THE DIAMAGNETIC CAVITY AXIS
Kenneth Schwartz and Gerald Schubert 1 Dec. 1972 36 p refs
(Contract NAS2-6876)
(NASA-CR-114546) Avail: NTIS HC $4.00 CSCL 03B

An analytic theory is developed for the time dependent magnetic fields inside the Moon and the diamagnetic cavity when the interplanetary electromagnetic field fluctuation propagates parallel to the cavity axis. The Moon model has an electrical conductivity which is an arbitrary function of radius. The lunar cavity is modelled by a nonconducting cylinder extending infinitely far downstream. For frequencies less than about 50 Hz, the cavity is a cylindrical waveguide below cutoff. Thus, cavity field perturbations due to the Moon do not propagate down the cavity, but are instead attenuated with distance downstream from the Moon. Author

N73-15862*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEVELOPMENT AND APPLICATIONS OF AN ORBITAL INSERTION SURFACE FOR THE SPACE SHUTTLE ORBITER/TUG
A. W. Deaton and P. D. Brandon 10 Jan. 1973 24 p ref
(NASA-TM-X-64715) Avail: NTIS HC $3.25 CSCL 22A

The concept of a space shuttle orbit/tug orbital insertion surface is developed. Practical applications in the area of ascent targeting, on-orbit rendezvous targeting, payloads/OMS propellant off-loading, and mission analysis are identified. Author

N73-15863*# California Univ., Los Angeles. Space Science Center.
TRAPPED AND PRECIPITATING ELECTRONS EXPERIMENT (F-16) ON THE ORBITING GEOPHYSICAL OBSERVATORIES PROGRAM OGO-6 MISSION Final Report, Mar. 1966 - Jun. 1972
Thomas A. Farley 27 Nov. 1972 14 p
(Contract NAS5-9308)
(NASA-CR-130137) Avail: NTIS HC $3.00 CSCL 03B

An electron spectrometer instrument for the Orbiting Geophysical Observatories program (OGO 6) was built. The data reduction and analysis of the experiment data are discussed. Author

N73-15864*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ATMOSPHERIC AND SURFACE PROPERTIES OF MARS OBTAINED BY INFRARED SPECTROSCOPY ON MARINER 9
B. Conrath, R. Curran, R. Hanel, V. Kunde, W. Marguire, J. Pearl, J. Pirraglia, J. Welker, and T. Burke Dec. 1972 42 p refs Submitted for publication
(NASA-TM-X-66150; X-620-72-486) Avail: NTIS HC $4.25 CSCL 03B

During the eleven month operational lifetime of Mariner 9, the infrared spectroscopy experiment obtained data over a large portion of Mars. Recently obtained spectra indicate that strong seasonal variations in the water vapor distribution over both polar regions occurred. The wettest atmospheric conditions observed so far contain 20 to 30 precipitable microns of water over the north polar cap during northern spring. A low resolution pressure map is presented which covers that portion of the planet between latitudes -60 deg and +25 deg. A more detailed study of the Coprates canyon indicates that at its lowest point the canyon floor must be at least 5 km below the rim. Applications of tidal theory to temperature fields derived from the spectra indicate diurnal surface pressure fluctuations of as much as 12 percent during the great dust storm of 1971-72. Qualitative arguments based on radiative transfer calculations for model dust clouds composed of spherical quartz particles suggest that particle radii during the storm were of the order of a few microns. Author

N73-15865*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN ANALYSIS OF THE VENUS MEASUREMENTS
John E. Ainsworth and Jay R. Herman Dec. 1972 109 p refs Submitted for publication
(NASA-TM-X-66140; X-625-72-187) Avail: NTIS HC $7.50 CSCL 03B

Plots of the Mariner 5 and Venera 4, 5, and 6 pressure vs temperature show that the Venera profiles are essentially congruent with the Mariner 5 day and night profiles, but are displaced 28 percent higher in pressure. Data suggest a variability in the atmospheric water vapor content in the region from 30 to 50 km. The Venera 7 measurements are interpreted as evidence for updrafts, down-drafts, horizontal wind layers, and nonaqueous precipitation. The previously observed band of retrograde winds which circle the equator with an average speed of 110 m/s is found to extend downward to the one atmosphere level at the equatorial morning terminator. The possibility of a low altitude equator-to-pole circulation with warm gas rising at the poles is inferred. Venera 7 temperature data used with radar topography

and microwaves interferometer measurements suggest that the variation of surface temperature with altitude in a band about the equator is less than 5 K/km. The available data are used to calculate a model of the structure of the Venus atmosphere for the first 75 km above the equatorial region. Author

N73-15866*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PROCEEDINGS OF THE SPACE SHUTTLE SORTIE WORKSHOP. VOLUME 1: POLICY AND SYSTEM CHARACTERISTICS
4 Aug. 1972 245 p ref Workshop held in Greenbelt, Md., 31 Jul. - 4 Aug. 1972
(NASA-TM-X-68841) Avail: NTIS HC $14.25 CSCL 22A

The workshop held to definitize the utilization of the space shuttle is reported, and the objectives of the workshop are listed. The policy papers are presented along with concepts of the space shuttle program, and the sortie workshop. F.O.S.

N73-15867*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PROCEEDINGS OF THE SPACE SHUTTLE SORTIE WORKSHOP. VOLUME 2: WORKING GROUP REPORTS
4 Aug. 1972 561 p refs Conf. held at Greenbelt, Md., 31 Jun. - 4 Aug. 1972
(NASA-TM-X-68842) Avail: NTIS HC $30.25 CSCL 22A

Details are presented on the mission planning progress in each of the working paper reports. The general topics covered are the following: space technology; materials processing and space manufacturing; communications and navigation; earth and ocean physics; oceanography; earth resources and surface environmental quality; meteorology and atmospheric environmental quality; life sciences; atmospheric and space physics; solar physics; high energy cosmic rays; X-ray and gamma ray astronomy; ultraviolet-optical astronomy; planetary astronomy; and infrared astronomy. N.E.N.

N73-15868*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OBSERVATIONS OF THE SUN, AN ULTRAVIOLET VARIABLE STAR
Donald F. Heath Dec. 1972 33 p refs
(NASA-TM-X-66142; X-651-72-456) Avail: NTIS HC $3.75 CSCL 03B

The uncertainty as to whether or not the sun is a variable star in that region of the ultraviolet which is absorbed in the mesosphere and stratosphere led to an experiment with acronym MUSE, Monitor of Ultraviolet Solar Energy. The experiment was first flown on an Aerobee rocket in August 1966 and subsequently on Nimbus 3 and 4 in April 1969 and April 1970 respectively. The basic philosophy behind the design of the experiment was to provide an instrument which would not require a solar pointing mechanism and at the same time would be capable of high radiometric accuracy for long periods in space. Author

N73-15869*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GODDARD BROUWER ORBIT BULLETIN
D. B. Morgan and R. A. Gordon Jul. 1971 200 p refs
(NASA-TM-X-66141; X-552-72-368) Avail: NTIS HC $12.00 CSCL 22C

The bulletin provides operational support for earth space research and technological missions by producing a tape containing pertinent spacecraft orbital information which is provided to a number of cities around the world in support of individual missions. A program description of the main and associated subroutines, and a complete description of the input, output and requirements of the bulletin program are presented. Author

N73-15870# Royal Greenwich Observatory, Herstmonceux (England).
AN ABUNDANCE ANALYSIS OF ALPHA CENTAURI
Valerie A. French and A. L. T. Powell Oct. 1971 44 p refs Prepared jointly with Roy. Obs., Capetown
(Roy-Obs-Bull-173) Avail: NTIS HC $4.25; Roy. Greenwich Obs., Herstmonceux 60p

The chemical composition of the components A and B of alpha Centauri has been examined. Abundances of twenty-two elements have been determined from 921 and 1029 spectral lines respectively and both stars are found to have small overabundances of metals compared with the sun. Author (ESRO)

N73-15871# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SPACECRAFT CONTROL OVER A SEGMENT OF THE ATMOSPHERIC REENTRY TRAJECTORY USING ONBOARD COMPUTERS
I. S. Ukolov, E. I. Mitroshin, V. E. Kraizman, and L. G. Oleinichenko 12 Jul. 1972 15 p refs Transl. into ENGLISH from Tr. Aviat. Inst. (Moscow), no. 7, 1970 p 52-60
(AD-750520; FTD-HC-23-1137-72) Avail: NTIS CSCL 22/3

The report presents 2 descriptions of a computerized automatic control system for the trajectory of a spacecraft in the first stage of reentry at speeds greater than 7 m per sec, i.e., the stage in which the spacecraft is deflected beyond the atmosphere. The primary purpose of the control system is to bring the spacecraft to a secondary reentry that is a given distance away from the initial reentry point, regardless of the large set of possible initial conditions and acting disturbances. To reduce the volume of prelaunch data storage, the proposed system combines computational prediction of the parameters of motion with the principles of closed loop feedback. Author (GRA)

N73-15872# Owens Valley Radio Observatory, Pasadena, Calif.
APERTURE SYNTHESIS STUDY OF NEUTRAL HYDROGEN IN NGC 2403 AND NGC 4236. 1: OBSERVATIONS. 2: DISCUSSION
G. S. Shostak and D. H. Rogstad 1972 60 p refs
(Contract N00014-67-A-0094-0019)
(AD-748983; Rept-1972-10) Avail: NTIS CSCL 03/2

Observational results of an aperture synthesis study of neutral hydrogen in the nearby galaxies NGC 2403 and NGC 4236 are presented. Maps of the integral of the line profile at each position on the galaxies are given, as well as maps showing lines of constant radial velocity determined from the peaks of the profiles. Spatial resolution is 2' of arc; velocity resolution is 21 km/s. In addition, line profiles for the galaxies as a whole and maps of the 1420 MHz continuum radiation from each object are displayed. Author (GRA)

N73-15873# Owens Valley Radio Observatory, Pasadena, Calif.
INTERFEROMETRIC OBSERVATIONS OF FORMALDEHYDE ABSORPTION IN FRONT OF STRONG GALACTIC SOURCES
E. B. Fomalont and Welia 1972 35 p refs Prepared in cooperation with Natl. Radio Astronomy Observatory, Green Bay, W. Va.
(Contract N00014-67-A-0094-0019)
(AD-749772; Rept-1972-9) Avail: NTIS CSCL 03/2

Observations have been made of formaldehyde absorption at 4830 MHz in front of Sgr A, Sgr B2, W3, NGC 2024, W31, W33, W43, W49 A and W51. The California Institute of Technology interferometer, consisting of two 90-foot paraboloids, was used to synthesize a beam of 40 x 60 sec(delta - l) where delta is the source declination and l = 38 degrees. The main absorption features show variations of optical depth over the sources but there is no significant clumping. Author (GRA)

N73-15874# Owens Valley Radio Observatory, Pasadena, Calif.
PERIODIC MEASUREMENTS OF THE INTEGRATED STOKES PARAMETERS OF COMPACT RADIO SOURCES
G. L. Berge and G. A. Seielstad 1972 29 p refs
(Contract N00014-67-A-0094-0019)
(AD-749771; Rept-1972-5) Avail: NTIS CSCL 03/2

The complete state of the integrated radiation from several compact radio sources was measured at three frequencies and at several epochs: 1420 MHz (1971.0), 1602 MHz (1971.1), and 5000 MHz (1971.5, 1971.8, 1972.0). The latter represents the beginning of a program that is still in progress, to monitor selected sources periodically at 5000 MHz. Although the authors were primarily interested in circular polarization, all four Stokes parameters were, in fact, obtained, and all of the results are presented herein. Author (GRA)

N73-15875# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE BIRTH OF THE STARS
S. B. Pikelner 2 Aug. 1972 28 p refs Transl. into ENGLISH from Priroda (USSR), no. 11, 1970 p 42-49
(AF Proj. 4150)
(AD-749734; FTD-MT-24-2077-71) Avail: NTIS CSCL 03/2

The report gives an outline of current theories concerning the origin and evolution of stars. The topics include the initial stage of the evolution of the galaxy, the heating and ionization of the interstellar gas, the formation of massive stellar clusters and associations, and the phenomena occurring in spiral arms. The condensation of the interstellar diffusive medium is given as the most probable mechanism of the birth of stars supported by the bulk of available data. Other hypotheses are also mentioned, in particular that of Ambartsumian according to which spontaneous decay of superdense bodies of unknown physical nature may be responsible for the formation of stellar systems and galaxies.
Author (GRA)

N73-15375* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SATELLITE HEIGHT DETERMINATION USING SATELLITE-TO-SATELLITE TRACKING AND GROUND LASER SYSTEMS
Fredrich O. Vonbun *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 13 p refs (For availability see N73-15369 06-13)
CSCL 22C

N73-15376* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SATELLITE ALTITUDE DETERMINATION UNCERTAINTIES
Joseph W. Siry *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 31 p refs (For availability see N73-15369 06-13)
CSCL 22C

N73-15378* Wolf Research and Development Corp., Riverdale, Md.
OPTIMUM USAGE OF GROUND STATIONS FOR GEOS-C ORBIT DETERMINATION
Chreston F. Martin *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 17 p refs (For availability see N73-15369 06-13)
(Contract NAS6-1942)
CSCL 22C

N73-15379* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRECISION TRACKING SYSTEMS OF THE IMMEDIATE FUTURE: A DISCUSSION
David E. Smith *In* NOAA Sea Surface Topography from Space, Vol. 1 Feb. 1972 9 p refs (For availability see N73-15369 06-13)
CSCL 22C

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also: 28 Propulsion Systems; and 32 Structural Mechanics.

N73-15876 National Lending Library for Science and Technology, Boston Spa (England).
DEVELOPMENT OF SOVIET MANNED SPACECRAFT
K. Feoktistov [1972] 6 p Transl. into ENGLISH from Aviatsiya i Kosmonavtika (Moscow), no. 11, 1971
(NLL-M-22222-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The history of the development of Soviet manned spacecraft is presented in brief form. The rationale behind the selected design of the spacecraft is discussed. The manner in which various problems of spacecraft orbiting and reentry were solved is reported. A chronology of Soviet manned space flights is included. P.N.F.

N73-15877*# Allied Research Associates, Inc., Concord, Mass.
THE BEST OF NIMBUS
Mar. 1971 130 p refs Original contains color illustrations
(Contract NAS5-10343)
(NASA-CR-130144; Rept-9G45-80) Avail: NTIS HC $8.50 CSCL 22C

Some of the highlights of the Nimbus six-year history are reviewed. From the hundreds of thousands of pictures and other results available, attempts have been made to select those which best represent the many data types and application areas. These results provide a capsule summary of the history and achievements of the Nimbus program. Author

N73-15878*# California Univ., Los Angeles. Dept. of Planetary and Space Science.
ERROR ANALYSIS OF EARTH PHYSICS SATELLITE SYSTEMS Final Report, 1 Apr. 1970 - 1 Oct. 1972
William M. Kaula 1 Oct. 1972 46 p refs
(Grant NGR-05-007-280)
(NASA-CR-130357) Avail: NTIS HC $4.50 CSCL 22C

Error analysis of distant-satellite-to-close-satellite range-rate, satellite-to-sea altimetry, and ground station to satellite range are made by simulations in which observational variances are assumed, observation equations are formed, and normal equations incremented. The final normal equation matrix is inverted to obtain standard deviations and correlation coefficients. The natural parameters solved for are the broad variations of the gravity field, represented by harmonic coefficients; local variations of gravity, represented by point masses; and the departure of the sea level from the geoid, represented by area means. A standard case of a low (263 km) polar close satellite, three equatorial geosynchronous satellites, and eight ground tracking stations is set up. Author

N73-15879*# North American Rockwell Corp., Downey, Calif. Space Div.
SPACE SHUTTLE ORBITER WINDSHIELD SYSTEM DESIGN AND TEST Final Report
K. Hayashida and M. J. Suppanz Nov. 1972 77 p refs
(Contract NAS1-10957)
(NASA-CR-112234; SD-72-SH-0123) Avail: NTIS HC $6.00 CSCL 22B

The development and testing of primary structural elements that are necessary to design a windshield system for the space shuttle orbiter are summarized. The elements include the outer (heat shield) panes, the inner pressure panes, the seals for both panes, and components of both window frames. One test article representing a pressure pane, including frames and seals, was tested under two sets of conditions. One set represented 100 mission cycles with temperature and pressure typical of those exerted on the innermost pane of the three-pane window system, and the second set represented 100 mission cycles with temperature and pressure typical of those exerted on a middle pane. A second test article representing an outer (heat sheild) pane was tested to conditions of 120 entry cycles, which equates to 100 entry cycles plus sufficient fatigue on the pane to account for 100 boost cycles. All elements of the design survived the test conditions in good condition. Window system for the shuttle orbiter vehicle. Author

N73-15880*# Teledyne Brown Engineering, Huntsville, Ala.
SKYLAB EXPERIMENTAL PERFORMANCE EVALUATION MANUAL. APPENDIX D: EXPERIMENT M487 HABITABILITY/CREW QUARTERS (MSFC)
K. S. Purushotham Jan. 1973 49 p refs
(Contract NAS8-21804)
(NASA-CR-61386) Avail: NTIS HC $4.50 CSCL 22B

This appendix contains a series of analyses for Experiment M487, Habitability/ Crew Quarters (MSFC), to be used for evaluating the performance of the Skylab corollary experiments under preflight, inflight, and post flight conditions. Experiment contingency plan workaround procedure and malfunction analyses are presented in order to assist in making the experiment operationally successful. Author

N73-15881# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF ROCKET CONTROL SYSTEMS WITH ON-BOARD DIGITAL COMPUTERS

V. D. Arens, S. M. Fedorov, M. S. Khitrik, and S. V. Luchko 3 Jan. 1973 237 p refs Transl. into ENGLISH of the book "Dinamika sistem upravleniya raket s bortovymi tsifrovymi vychislitelnymi mashinami" Moscow, Izd-vo Mashinostr., 1972 231 p
(JPRS-57893) Avail: NTIS HC $14.00

A study of the dynamics of digital rocket control systems is presented. Methods of simulating digital control systems with the application of analog and digital computers are discussed. The subjects include the following: (1) equations of motion of a rocket, (2) functional and structural schematics of stabilization systems for missiles with on-board digital computers, (3) basic characteristics of on-board digital computers and converters, (4) theory of digital automatic control systems, and (5) logarithmic frequency characteristics for analyzing dynamics of digital rocket control systems. Author

N73-15882*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE OBSERVATIONAL ENVIRONMENT OF ASTRONOMICAL SATELLITES AND RELATED SOFTWARE SUBROUTINES
Donald K. West and Edgar M. Greville (Computer Sci. Corp., Silver Spring, Md.) Dec. 1972 21 p refs
(NASA-TM-X-66145; X-672-72-466) Avail: NTIS HC $3.25 CSCL 22C

Methods are described for calculating significant factors in the observational environment of orbiting astronomical satellites. These factors must be considered in the process of scheduling observations and in data reduction. Subroutines which perform these calculations are described. Author

N73-15883*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OBSERVATIONS ON DEGRADATION OF UV SYSTEMS ON NIMBUS SPACECRAFT
Donald F. Heath and James B. Heaney Dec. 1972 23 p refs
(NASA-TM-X-66148; X-651-72-478) Avail: NTIS HC $3.25 CSCL 22B

Broad band photometer experiments in the 1200 to 3000 A have been operating on Nimbus 3 and 4 since April 1969 for the purpose of determining the nature of variations in the UV solar irradiance. An Ebert-Fastie double monochromator has been measuring the solar irradiance and earth radiance from 2500 to 3400 A for the determination of global atmospheric ozone distributions since April 1970. From prelaunch testing and an evaluation of the flight data it is concluded that the principal source of degradation is probably the spacecraft. The degradation produces a characteristic signal loss and change in angular response of the system which might be explained by micron sized droplets becoming a permanent residue under the influence of solar UV radiation. Author

N73-15884*# General Dynamics/Convair, San Diego, Calif.
INFLUENCE OF VIBRATION MODES ON CONTROL SYSTEM STABILIZATION FOR SPACE SHUTTLE TYPE VEHICLES Final Report
H. G. Greiner Nov. 1972 189 p refs
(Contract NAS1-10795)
(NASA-CR-112202; GDCA-DDE-72-005) Avail: NTIS HC $11.50 CSCL 22B

An investigation was made to determine the feasibility of using conventional autopilot techniques to stabilize the vibration modes at the liftoff flight condition for two space shuttle configurations. One configuration is called the dual flyback vehicle in which both the orbiter and booster vehicles have wings and complete flyback capability. The other configuration is called the solid motor vehicle win which the orbiter only has flyback. The results of the linear stability analyses for each of the vehicles are summarized. Author

N73-15885# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
THE ATTITUDE MEASUREMENT AND CONTROL SYSTEM OF THE AEROS SATELLITE AND ITS USE IN THE ACQUISITION PHASE [DAS LAGEMESS- UND LAGEREGELUNGSSYSTEM DES SATELLITEN AEROS UND SEIN EINSATZ IN DER AKQUISITIONSPHASE]
Fritz Leiss and Hans Dieter Zago (Ges. fuer Weltraumforsch.) Sep. 1972 31 p refs In GERMAN Presented at the 5th DGLR Ann. Meeting, Berlin, 4-6 Oct. 1972 Sponsored by Bundesmin. fuer Bildung und Wiss.
(DGLR-Paper-72-62) Avail: NTIS HC $3.75

The design and operation of the Aeros satellite attitude control system is described, and its application during the orbit acquisition phase is reviewed. The satellite is spin stabilized. Its active attitude control system operates magnetically and contains a passive mechanical mutation damping system. The torque for axial control is produced by two magnet coils with soft iron cores, parallel to the spin axis, whereas for spin control a magnet coil is used perpendicular to the spin axis. The control circuit for spin control is closed onboard. The control circuit for axial control is also closed onboard, when applied to rotation towards the sun. For rotation of the spin axis in other directions the control circuit is closed over ground with delayed commands. Author (ESRO)

N73-15886# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Fachbereich Regelungstechnik und Elektronik.
CONTRIBUTIONS TO THE STANDARDIZATION OF CONTROL SYSTEMS FOR SATELLITES AND PEAK PAYLOADS [BEITRAEGE ZUR STANDARDISIERUNG VON REGELUNGSSYSTEMEN FUER SATELLITEN UND NUTZLASTSPITZEN]
Horst Froehlich, Manfred Mall, and Gerhard Schweizer 1972 25 p refs In GERMAN Presented at the 5th DGLR Ann. Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-064) Avail: NTIS HC $3.25

The importance of standardization in satellite attitude control systems by using onboard computers, is discussed and exemplified by a proposal for the Aeros satellite. The present situation shows the development of special attitude control systems for each satellite, involving high costs and repeated qualification tests. The application of onboard computers allows use of the same control modules for different applications. A standardization is proposed by using a powerful central digital onboard computer capable of simultaneous processing of multiple tasks. This concept is applied to the Aeros satellite attitude control system, and the consequences for other spacecraft payloads are discussed.
Author (ESRO)

N73-15887# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
OBJECTIVE AND MISSION OF THE METEOSAT EUROPEAN METEOROLOGICAL SATELLITE [ZIEL UND AUFGABE DES EUROPAEISCHEN WETTERSATELLITEN METEOSAT]
E. Eimer 1972 9 p In GERMAN Presented at the 5th DGLR Ann. Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-82) Avail: NTIS HC $3.00

The objectives and mission of the Meteosat satellite are summarized. Meteosat is a meteorological space program under direction of ESRO. It forms part of the worldwide meteorological data acquisition, data processing, and data transmission system. The Meteosat is a geostationary satellite with special ground stations for traffic with the satellite and for data preparation, and should be operational before the end of 1976. Development costs are estimated at 400 million DM. Author (ESRO)

N73-15888# Ford Foundation, New York.
REMOTELY CONTROLLED MANIPULATOR FOR MAINTENANCE OF SPACECRAFT IN ORBIT [FERNGESTEUERTER MANIPULATOR ZUR WARTUNG VON RAUMFAHRZEUGEN IM ORBIT]
H. Kleinwaechter and W. Wienss 1972 9 p refs In GERMAN Presented at the 5th DGLR Ann. Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-098) Avail: NTIS HC $3.00

A synchronous remotely controlled manipulator for space maintenance is described. The most important information transmission system is the binocular stereo television camera. Force is transmitted by strain gages, and 7 degrees of freedom are available for manipulation. Author (ESRO)

N73-15889# Ford Foundation, New York.
THE STRUCTURAL ADAPTER OF THE HELIOS SOLAR PROBE. DESIGN OF AN ORTHOTROPIC CYLINDRICAL SHELL [DIE STRUKTURADAPTER DER HELIOS SONNENSODE DIE AUSLEGUNG EINER ORTHOTROPEN

ZYLINDERSCHALE IN DER PRAXIS]
Huba Oery 1972 141 p refs In GERMAN Presented at the 5th DGLR Ann. Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-101) Avail: NTIS HC $9.25

The design of an orthotropic cylindrical shell as a structural adapter for the Helois solar probe is discussed. This light metal adapter shell had a diameter of 940 mm and a length of 690 mm, and consists of a 0.3 mm skin, stiffened by 32 hat profile stringers (12 x 12 x 0.4) and two ribs. The load bearing capacity of the cylinder shell was investigated for the most important failure modes, such as buckling, fatigue, and acoustic fatigue. Other structures (isotropic or more stiffened orthotropic cylinders) were critically examined for the same buckling loads. The influence of the adapter's stiffness on the resonant frequency of the overall probe, as well as the estimation of shell vibrations, are shown.
Author (ESRO)

N73-15890# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
CINETHEODOLITE OBSERVATIONS MADE AT EARLY-BURN ON SATELLITE 1963-30D FROM 1965 NOVEMBER TO 1966 MARCH
K. S. Russell 4 Nov. 1972 35 p ref
(ROE-STS-132) Avail: NTIS HC $3.75

Estimated azimuth and elevation values of the satellite 1963-30 D recorded during 31 transits are given. ESRO

N73-15891# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
STOPWATCH OBSERVATIONS OF SATELLITES, OCTOBER 1972
R. D. Eberst 22 Nov. 1972 36 p
(ROE-STS-133) Avail: NTIS HC $4.00

Stopwatch observations made at stations during October 1972 are listed in launch and time order for each satellite. Various subtotals are given. ESRO

N73-15892# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
OPTIMIZATION OF SATELLITE GRAVITATIONAL STABILIZATION SYSTEMS
V. A. Sarychev and K. V. Lukanin 15 Mar. 1972 37 p refs Transl. into ENGLISH of Inst. Prikl. Mat., Akad. Nauk SSSR, Moscow, preprint no. 54, 1971
(AD-750555; APL-CLB-3-T-651) Avail: NTIS CSCL 22/1

A study is made of the dynamics of satellite gravitational stabilization systems with gyrodamping and two types of purely passive dampers. The greatest attention is devoted to examination of motion in the orbital plane. The parameters which yield maximum stability and those ensuring minimum amplitude of the eccentricity oscillations of a satellite for a specified degree of stability are determined. The three-dimensional motion is studied for the satellite-stabilizer system and the problem of increasing the speed of response and the accuracy of the system by introducing a damper in a special way is examined.
Author (GRA)

N73-15893# Ballistic Research Labs., Aberdeen Proving Ground, Md.
GENERALIZED SUBHARMONIC RESPONSE OF A MISSILE WITH SLIGHT CONFIGURATIONAL ASYMMETRIES
Charles H. Murphy Jun. 1972 49 p refs
(DA Proj. 1T0-61102-A-33D)
(AD-749787; BRL-1591) Avail: NTIS CSCL 16/2

The quasilinear analysis of the angular motion of slightly asymmetric missiles with a cubic static moment shows the existence of nonharmonic steady-state solutions. These solutions are described by sums of three constant amplitude rotating angles. One angle rotates at the spin rate and the other two rotate in opposite directions at approximately one-third the spin rate. This generalized subharmonic motion can be very much larger than the usual harmonic trim motion and can occur for spin rates greater than eight times the resonant spin rate. The predictions of the quasilinear theory are compared with the results of exact numerical integration of the equations of motion with much better than 5% agreement in all cases. Author (GRA)

N73-15894# Army Advanced Ballistic Missile Defense Agency, Huntsville, Ala.
ADVANCED HIGH ENERGY MISSILE CONTROL SYSTEMS
Larry C. Atha 1972 16 p refs
(AD-750306) Avail: NTIS CSCL 15/3

A new type of control concept which utilizes the interaction of an injected fluid with the airstream surrounding the missile to achieve control forces offers much promise to meet the control requirements for advanced ABM interceptors. Three of these advanced control concepts are described in this paper. They are: external burning, jet interaction, reactive jet interaction.
Author (GRA)

N73-15895# Space Data Corp., Phoenix, Ariz.
DESIGN, DEVELOPMENT AND FLIGHT TEST OF THE SUPER LOKI DART METEOROLOGICAL ROCKET SYSTEMS Final Report, 1 Feb. 1969 - 30 May 1972
Bruce Bollermann and Robert L. Walker 30 May 1972 236 p refs
(Contract F19628-69-C-0212; AF Proj. 6682)
(AD-750796; AFCRL-72-0382) Avail: NTIS CSCL 19/7

The Super Loki Dart Meteorological Rocket Systems have been developed to obtain high altitude temperature, density and wind measurements by means of small inexpensive rocket systems. The Super Loki Robin Dart System was designed as a replacement for the larger and more expensive Viper Robin Dart to obtain falling sphere density and wind data from an altitude of 30 km to 90 km. The Super Loki Transponder Dart was also developed in order to offer better wind and temperature data from 25 km to a higher altitude, 70 km, than the more expensive Arcas Transponder system. The Super Loki Transmitter Dart was developed as a candidate to replace the Loki Dart by also offering improved data to higher altitudes. Author (GRA)

N73-15896# Goodyear Aerospace Corp., Akron, Ohio.
EXPANDABLE AIRLOCK EXPERIMENT DO21 AND THE SKYLAB MISSION Final Technical Report, 15 Dec. 1966 - Dec. 1971
Lou Manning and Leo Jurich Sep. 1972 282 p refs
(Contract F33615-67-C-1380; AF Proj. 8170)
(AD-749131; GER-15607; AFAPL-TR-72-74) Avail: NTIS CSCL 22/2

The program was directed at evaluating the potential advantages of expandable structures to serve in certain space applications such as airlocks, crew quarters experiment chambers, emergency escape capsules, and crew transfer tunnels. The human factors characteristics and geometry were established after extensive underwater neutral buoyancy testing by the Air Force Aero Medical Laboratory. The airlock design dimensions were found adequate to accommodate the entry of a fully suited rescuer with pack to rescue another crewman simulating an incapacitated condition. Hatch size, latching, and opening features, mobility restraints and lighting requirements were also established.
Author (GRA)

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N73-15897 National Lending Library for Science and Technology, Boston Spa (England).
ALLOWANCE FOR DEPARTURE FROM SIMILARITY BETWEEN DEVIATORS IN THE DETERMINATION OF THE WORK DONE IN PLASTIC DEFORMATION
K. Kaszap [1972] 10 p refs Transl. into ENGLISH from Periodica Polytech. (Budapest), no. 15, 1971 p 17-25 No diagrams, etc.; to be used in conjunction with original paper
(NLL-M-22004-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The effect of departure from similarity between the stress deviator and the increment in the deformation deviator on the specific work done in plastic deformation is considered on the

basis of experiments. The experiments were made with thin walled nickel and copper pipes. The pipes were loaded with an axial stretching force and an internal hydraulic pressure. Both simple and complex loadings were considered. The specific work done in plastic deformation was determined in two ways from experiments. In one case it was assumed that the stress, deviator and the increment in the plastic deformation were similar; in the other case the departure from similarity was taken into account. Author

N73-15898 Engineering Sciences Data Unit, London (England).
NATURAL FREQUENCIES OF FLAT OR SINGLY-CURVED SANDWICH PANELS WITH CORES OF ZERO FLEXURAL STIFFNESS
Jun. 1972 13 p refs Supersedes ESDU-66020 Sponsored by Roy. Aeron. Soc.
(ESDU-72016; ESDU-66020) Copyright. Avail: Issuing Activity

A method of calculating the natural frequencies of initially unstressed flat or curved rectangular panels of sandwich construction with identical face plates is reported. The core is assumed to have zero flexural stiffness and to be isotropic, but a moderate degree of orthotropy can be taken into account. The data have been derived for application to honeycomb sandwich panels, but may be used for other types of sandwich panel having cores of negligible flexural stiffness. The natural frequency of the sandwich panel is obtained by factoring the natural frequency of a solid flat plate of thickness equal to the distance between the mid-planes of the face plates. Author

N73-15899 Engineering Sciences Data Unit, London (England).
ENDURANCE OF ALUMINUM ALLOY STRUCTURAL ELEMENTS SUBJECTED TO SIMULATED ACOUSTIC LOADING
Jun. 1972 25 p refs Supersedes ESDU-66022 Sponsored by Roy. Aeron. Soc.
(ESDU-72015; ESDU-66022) Copyright. Avail: Issuing Activity

Fatigue tests on aluminum alloy specimens, typical of aircraft structural elements, excited by narrow-band loading of random amplitude with zero mean load to simulate stress response to acoustic loading are reported. Methods used to detect failure are described and typical locations of failures are illustrated. Typical stress distributions across the failure lines are shown. The loading simulated for the skin-stiffener test specimens is limited to modes where skin-stiffener flexure predominates. Author

N73-15900 Engineering Sciences Data Unit, London (England).
STRESS RESPONSE OF FLAT OR SINGLY-CURVED SANDWICH PANELS WITH CORES OF ZERO FLEXURAL STIFFNESS SUBJECTED TO RANDOM ACOUSTIC LOADING
Aug. 1972 31 p Sponsored by Royal Aeron. Soc.
(ESDU-72017) Copyright. Avail: Issuing Activity

A method for estimating the rms stress in the face plates of a sandwich panel subjected to random acoustic loading is presented. The panels are initially unstressed, flat, or singly-curved panels with identical face plates. The data apply particularly to honeycomb sandwich panels but can be used for other sandwich panels provided the core properties are such as to comply with the assumptions imposed by the tests. Mathematical models are included to clarify the theoretical aspects. Graphs of the data are included. Author

N73-15901 Engineering Sciences Data Unit, London (England).
ENDURANCE OF ALUMINIUM ALLOY LUGS WITH PUSH-FIT PINS (TENSILE MEAN STRESS)
Oct. 1972 19 p refs Supersedes ESDU-Fat-E.05.03 Sponsored by Roy. Aeron. Soc.
(ESDU-72020; ESDU-Fat-E.05.03) Copyright. Avail: Issuing Activity

An analysis of the fatigue life of aluminum alloy lugs with push-fit pins under tensile stress conditions is presented. All the lugs were loaded axially through steel pins. No bending loads were applied. No transfer of load by friction occurred. No methods for improving endurance were used, but all pins were lightly greased prior to assembly. Lugs were manufactured from Al-Cu-Mg or Al Zn-Mg alloys. Data from the tests are presented in the form of tables and graphs. Author

N73-15902 Engineering Sciences Data Unit, London (England).
PROPERTIES OF MATERIALS IN COMPRESSION
Jul. 1972 4 p refs
(ESDU-00.01.01-Amend-A) Copyright. Avail: Issuing Activity

Values of compressive stress-strain parameters are given for a number of aircraft materials. The proof stresses were reduced from test results to correspond with the minimum tensile proof stresses in the appropriate material specifications. The results are given in tables. Author

N73-15903 Engineering Sciences Data Unit, London (England).
SANDWICH PANELS WITH CORRUGATED CORE AND EQUAL FACE PLATES TRANSVERSE SHEAR STIFFNESS
Dec. 1969 3 p refs
(ESDU-07.03.01) Copyright. Avail: Issuing Activity

The shear stiffness factor is plotted against the ratio of the corrugation pitch to the depth of core less the thickness of sheet for various values of the angle between the face plates and the straight diagonal portion of corrugation leg. The shear stiffness of the corrugated panel depends on the nature of the attachments of the core to the face plates, weather by adhesive, rivets, or spotwelds. The values given are appropriate to a line weld attachment. D.L.G.

N73-15904 Engineering Sciences Data Unit, London (England).
ESTIMATION OF rms STRESS IN SKIN PANELS SUBJECTED TO RANDOM ACOUSTIC LOADING
Oct. 1972 2 p Sponsored by Roy. Aeronaut. Soc.
(ESDU-67028-Amend-A) Copyright. Avail: Issuing Activity

An existing theory for describing the response of skin panels to acoustics loads and stress is simplified. The simplified theory is outlined and experimental results are given to show the orders of accuracy which can be achieved on full scale structures in true noise environments. Experimental results are generally within a factor of 2 of the rms stress estimates. Author

N73-15905 Engineering Sciences Data Unit, London (England).
STIFFNESS OF FLAT STRIPS IN COMPRESSION UNDER SINUSOIDALLY DISTRIBUTED BENDING COUPLES AT THEIR EDGES. (MODE 1: LOADED EDGE SIMPLY-SUPPORTED, REMOTE EDGE FREE; EXTENDED RANGE)
Jul. 1972 3 p refs
(ESDU-02.01.30-Amend-A) Copyright. Avail: Issuing Activity

The stiffnesses presented are appropriate to the case of an infinitely long thin flat strip simply supported at one edge, completely free of restraint at the other edge, and subjected to a longitudinal compressive stress distributed uniformly across its cross section. The simply-supported edge is loaded by a bending couple distributed sinusoidally along the length, and the stiffnesses represented are those corresponding to a loading of this type. The cross section of the strip is bent by this couple and, in consequence, the edge rotates about the edge line which is fixed in space. Author

N73-15906 Engineering Sciences Data Unit, London (England).
INFORMATION ON THE USE OF DATA ITEMS ON THE BUCKLING OF PLATES AND COMPRESSION PANELS MANUFACTURED FROM ISOTROPIC MATERIALS
Jun. 1972 11 p Supersedes ESDU-Struct-02.01.00 Sponsored by Roy. Aeron. Soc.
(ESDU-72012; ESDU-Struct-02.01.00) Copyright. Avail: Issuing Activity

General information is presented on the use of data items in the Structures Sub-series on quadrilateral plates and panels subjected to in-plane compression. The area of coverage includes behavior at initial buckling, immediately after buckling, and at failure. Author

N73-15907 Engineering Sciences Data Unit, London (England).
PRINCIPAL STRESSES AND STRAINS IN A TWO-DIMENSIONAL STRESS FIELD
Jul. 1972 15 p ref Sponsored by Roy. Aeron. Soc.
(ESDU-72013) Copyright. Avail: Issuing Activity

Curves are given which enable the magnitudes and directions of the principal stresses in a plane (two-dimensional) stress field

to be obtained from the components of the direct and shear stress. The relationships on which these curves are based are given together with simple supplementary formulas which allow the corresponding principal strains and maximum shear stresses and strains to be calculated. Data may be applied to all structures and components of either isotropic or anisotropic materials. The stress curves obtained are included. Author

N73-15908 Engineering Sciences Data Unit, London (England).
BUCKLING OF FLAT ISOTROPIC PLATES UNDER UNIAXIAL AND BIAXIAL LOADING
Aug. 1972 18 p refs Supersedes ESDU-Struct-02.01.01, ESDU-Struct-02.01.19, ESDU-Struct-02.01.20, ESDU-Struct-02.01.21, ESDU-Struct-02.01.38, ESDU-Struct-02.01.39, ESDU-Struct-02.01.40, ESDU-Struct-02.01.41, ESDU-Struct-02.01.42, ESDU-Struct-02.01.43, ESDU-Struct-02.01.44, and ESDU-Struct-02.01.45 Sponsored by Roy. Aeron. Soc. (ESDU-72019; ESDU-Struct-02.01.01; ESDU-Struct-02.01.19; ESDU-Struct-02.01.20; ESDU-Struct-02.01.21; ESDU-Struct-02.01.38; ESDU-Struct-02.01.39; ESDU-Struct-02.01.40; ESDU-Struct-02.01.41; ESDU-Struct-02.01.42; ESDU-Struct-02.01.43; ESDU-Struct-02.01.44; ESDU-Struct-02.01.45) Copyright. Avail: Issuing Activity

Elastic buckling stresses are presented for flat isotropic plates under combinations of in-plane direct loadings. The data are given in non-dimensional form for several combinations of the basic edge conditions including: clamped, simply supported and free edges, and longitudinally loaded plates with elastic restraint on the unloaded edges. Data are also provided to correct the buckling stress for the effects of plasticity. Author

N73-15909*# University of South Florida, Tampa. Coll. of Engineering.
DEVELOPMENTS IN ELASTIC WAVE PROPAGATION IN CYLINDRICAL SHELLS
Larry Oline 31 Aug. 1972 12 p refs
(Grant NGR-10-008-028)
(NASA-CR-112222) Avail: NTIS HC $3.00 CSCL 20K

Literature on longitudinal wave propagation in cylindrical shells is reviewed. F.O.S.

N73-15910# Tohoku Univ., Sendai (Japan). Inst. of High Speed Mechanics.
REPORTS OF THE INSTITUTE OF HIGH SPEED MECHANICS, TOHOKU UNIVERSITY, VOLUME 26, 1972
1972 111 p refs
Avail: NTIS HC $7.75

High speed mechanical research is discussed, including modified Flugge equations for the buckling of circular cylindrical shells, supercavitating jet flapped hydrofoil, swirling flow breakdown in circular pipe, and surface pressure distribution on hydrofoil profiles in cascade. For individual titles, see N73-15911 through N73-15914.

N73-15911 Tohoku Univ., Sendai (Japan).
MODIFIED FLUGGE EQUATIONS FOR THE BUCKLING OF CIRCULAR CYLINDRICAL SHELLS
N. Yamaki *In its* Repts. of the Inst. of High Speed Mech., Tohoku Univ., Vol. 26 1972 p 1-14 refs Presented at the Hitachi Reg. Meeting of the Japan Soc. of Mech. Engr., 5 Nov. 1971 (For availability see N73-15910 06-32)
(Rept-248)

The Flugge equations for the buckling of circular cylindrical shells are known to be valid for any geometrical configurations of thin shells, but the prebuckling deformation is assumed to be given by the membrane theory of shells. The basic equations for the buckling problem are derived by extending the Flugge theory to include the effect of finite prebuckling deformations. Several assumptions are introduced to simplify the analysis, and the principle of stationary potential energy is applied. Author

N73-15912 Tohoku Univ., Sendai (Japan).
PERFORMANCE ANALYSIS ON A SUPERCAVITATING JET FLAPPED HYDROFOIL c12
R. Oba and J. Higuchi *In its* Repts. of the Inst. of High Speed Mech., Tohoku Univ., Vol. 26 1972 p 15-40 refs Presented at the 49th Conf. of Jap. Soc. Mech. Engr., 3 Apr. 1972 (For availability see N73-15910 06-32)
(Rept-249)

Drag reduction due to combined effects of the foil camber and the jet flap are examined for the supercavitating hydrofoil. Improved off-design performance, increased cavity thickness, and the jet momentum flux are included, along with a quantitative analysis of data on hydrofoil characteristics. J.A.M.

N73-15913 Tohoku Univ., Sendai (Japan).
BREAKDOWN OF SWIRLING CAVITY FLOW IN A CIRCULAR PIPE. REPORT 2: INVESTIGATIONS OF CAVITY SURFACE c12
H. Hashimoto *In its* Repts. of the Inst. of High Speed Mech., Tohoku Univ., Vol. 26 1972 p 41-72 refs Presented at the 46th Gen. Meeting of the Japan Soc. of Mech. Engr., 3 Apr. 1969 (For availability see N73-15910 06-32)
(Rept-250)

A breakdown phenomenon on a cylindrical cavity along the axis of swirling water flow in a circular pipe was studied theoretically, considering the fluid motion at the cavity surface. A numerical analysis demonstrated the relationship between the diameter of the cavity and the velocity distributions of water outside the cavity. The breakdown phenomenon was discussed hydrodynamically by comparison of the results with those obtained experimentally. Author

N73-15914 Tohoku Univ., Sendai (Japan).
SURFACE PRESSURE DISTRIBUTION ON HYDROFOIL PROFILES IN CASCADE. REPORT 2: ACCELERATING CASCADE FLOW c12
F. Numachi *In its* Repts. of the Inst. of High Speed Mech., Tohoku Univ., Vol. 26 1972 p 73-108 refs Presented at the 47th Gen. Meeting of the Japan Soc. of Mech. Engr., 31 Mar. 1970 (For availability see N73-15910 06-32)
(Rept-251)

Pressure distribution divergence is analyzed around cascade hydrofoils between the configuration prescribed in developing the profile form and that actually measured in cavitation tunnel tests. Boundary layer calculations were undertaken using the data from the experiments. Whether the position of incipient cavitation head is influenced by those of the points of laminar boundary layer instability, separation, and transition in boundary layer to turbulent flow is also discussed. Author

N73-15915# Pisa Univ. (Italy). School of Engineering.
THEORETICAL AND EXPERIMENTAL RESEARCH ON THE FATIGUE BEHAVIOR IN A POST-CRITICAL REGIME OF PHASE PANELS STIFFENED BY RECTANGULAR CHANNELS SUBJECTED TO CYCLIC COMPRESSION LOADS [RICERCHE TEORICHE E SPERIMENTALI SUL COMPORTAMENTO A FATICA IN REGIME POST-CRITICO DI PANNELLI PIANI IRRIGIDITI CON CURRENTI A RETTANGULO SOTTOPOSTI A CARICHI RIPETUTI DI COMPRESSIONE]
Attilio Salvetti and Carlo Casarosa Sep. 1969 99 p refs In ITALIAN Presented at the AIDA-AIR Congr., Rome, Sep. 1969 Sponsored by CNR *Its* Ser. 28a
(Publ-1351; Rept-21) Avail: NTIS HC $7.00

The results are presented of theoretical and experimental research on the fatigue behavior of corrugated panels, riveted along the lamination, subjected to the deformation of repeated critical compressive loads. The cyclic critical loads result in fatigue cracking, localized at the rivet along the corrugation. This produces a progressive destruction which is associated with a diminished critical load and rigidity in the post-critical regime of the panel. The results of a theoretical analysis of tension and deformation in the postcritical panel are presented along with the results of fatigue tests for 15 panels of various sizes.
Transl. by F.O.S.

N73-15916# Loughborough Univ. of Technology (England). Dept. of Transport Technology.
BUCKLING OF THIN CLAMPED-FREE CIRCULAR CYLINDRICAL SHELLS SUBJECTED TO WIND LOAD
S. Gopalacharyulu and D. J. Johns Dec. 1971 65 p refs
(TT-7113) Avail: NTIS HC $5.25

An attempt is made to study the buckling problem of

clamped-free, thin cylindrical shells subjected to wind loading. Trefftz's variational theory is employed to determine the Euler buckling pressures. The pre-buckling analysis was carried out using Donnell's linear theory. Nonlinear terms in the strain tensor are retained in the calculation of second variation of potential energy. By broadening the function set of virtual displacement components, the computed buckling pressures are reduced to form some bounds for the experimental data. Geometric imperfections and dynamic effects are ignored; only static instability is investigated. Author

N73-15917# National Aerospace Lab., Tokyo (Japan).
ON THE NATURAL VIBRATION OF PLATE-BEAM COMBINATION STRUCTURES, 3
Taketoshi Hanawa, Yoichi Hayashi, Yasuo Tada, Susumu Toda, and Kazuo Kusaka Jul. 1972 33 p refs In JAPANESE; ENGLISH summary
(NAL-TR-291) Avail: NTIS HC $3.75

A method for analyzing the natural vibration characteristics of plate-beam combination structures is presented. Structures of built up delta wings and fuselages are used as examples. Numerical analyses of the aerodynamic characteristics in supersonic flight are developed. Vibration tests were conducted to provide a comparison with the simulation tests. Author

N73-15918# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
AN ELLIPTICAL CRACK SUBJECTED TO AN IMPULSIVE LOAD APPLIED TO ITS BOUNDARY
M. Ziv Feb. 1971 20 p refs
(TAE-148) Avail: NTIS HC $3.00

A boundary value problem where a crack is subjected to an impulsive load is solved. The crack considered is an elliptic cylindrical cavity in an infinite solid. The applied load is an impulsive step function of the Heaviside type and is distributed uniformly over the entire cavity. The solid is made of an ideal elastic material. Critical values of the stress distribution are calculated by the characteristics method to determine the decay of the generated wave. Author

N73-15919*# Michigan Univ., Ann Arbor. Dept. of Materials and Metallurgical Engineering.
TIME-DEPENDENT EDGE-NOTCH SENSITIVITY OF OXIDE AND GAMMA PRIME DISPERSION STRENGTHENED SHEET MATERIALS AT 1000 TO 1800 F (538 - 982 C) Progress Report
David J. Wilson Sep. 1972 48 p refs
(Grant NGL-23-005-005)
(NASA-CR-121123; UMICH-043680-19-T) Avail: NTIS HC $4.50 CSCL 20K

Research was carried out to determine whether an oxide dispersion hardened alloy, TD-Ni, Cr, and low volume fraction gamma prime strengthened nickel-base alloy, Modified Waspaloy, were susceptible to time-dependent edge-notch sensitivity. The results were evaluated in terms of the mechanical characteristics of the alloys and the dislocation motion mechanisms operative. As far as could be determined, the results of the investigation were consistent with the following important concepts developed for Waspaloy and Inconel 718: (1) Time-dependent edge-notch sensitivity occurs when notched specimens are loaded below the approximate 0.2 percent smooth specimen offset yield strength and when data from smooth specimens indicate that small amounts of creep consume large rupture life fractions. (2) When precipitate particles are sheared by dislocations, the deformation is localized and time-dependent notch sensitivity occurs. When dislocations by-pass precipitate particles the deformation is homogeneous. Under these conditions, no time-dependent notch sensitivity has been observed. Author

N73-15920*# Boeing Co., Seattle, Wash. Aerospace Group.
SUBCRITICAL CRACK GROWTH OF SELECTED AEROSPACE PRESSURE VESSEL MATERIALS
L. R. Hall and W. D. Bixler Dec. 1972 138 p refs
(Contract NAS3-12044)
(NASA-CR-120834; D180-14855-1) Avail: NTIS HC $9.00 CSCL 20K

This experimental program was undertaken to determine the effects of combined cyclic/sustained loads, stress level, and crack shape on the fatigue crack growth rate behavior of cracks subjected to plane strain conditions. Material/environment combinations tested included: 2219-T87 aluminum plate in gaseous helium, room air, and 3.5% NaCl solution at room temperature, liquid nitrogen, and liquid hydrogen; 5Al-2.5 Sn (ELI) titanium plate in liquid nitrogen and liquid hydrogen and 6AL-4V (ELI) STA titanium plate in gaseous helium and methanol at room temperature. Most testing was accomplished using surface flawed specimens instrumented with a clip gage to continuously monitor crack opening displacements at the specimen surface. Tapered double cantilever beam specimens were also tested. Static fracture and ten hour sustained load tests were conducted to determine fracture toughness and apparent threshold stress intensity values. Cyclic tests were performed using sinusoidal loading profiles at 333 MHz (20 cpm) and trapezoidal loading profiles at both 8.3 MHz (0.5 cpm) and 3.3 MHz (0.2 cpm). Data were evaluated using modified linear elastic fracture mechanics parameters. Author

N73-15921# Sandia Labs., Albuquerque, N.Mex.
FORCED MOTION OF CYLINDRICAL SHELLS: A COMPARISON OF SHELL THEORY WITH ELASTICITY THEORY
L. I. Weingarten and H. Reisman (State Univ. of N. Y. at Buffalo) 10 Jan. 1973 39 p refs Sponsored in part by AEC Prepared in cooperation with State Univ. of N. Y. at Buffalo Backup document for AIAA Synoptic scheduled for publication in AIAA Journal in Jun. 1973
(Grants AF-AFOSR-1971-71; NSF GP-7318; FR-00126)
Avail: NTIS HC $4.00

The dynamic response of a freely supported circular cylindrical shell is treated within the framework of the three dimensional theory of elasticity. A numerical comparison of this solution with corresponding solutions within the framework of the Flugge and improved shell theories is presented for a specific load distribution and shell geometry. When compared to the elasticity theory solution, it is shown that improved theory is better than Flugge theory in predicting the response over times which contain the maximum stresses and displacements. The results also show that caution must be used when applying either of the shell theories to the initial response. Author

N73-15922*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ROLLING-ELEMENT FATIGUE LIFE OF SILICON NITRIDE BALLS: PRELIMINARY TEST RESULTS
Richard J. Parker and Erwin V. Zaretsky Nov. 1972 13 p refs
(NASA-TM-X-68174; E-7219) Avail: NTIS HC $3.00 CSCL 20K

Hot pressed silicon nitride was evaluated as a rolling element bearing material. The five-ball fatigue tester was used to test 12.7 mm (0.500 in.) diameter balls at a maximum Hertz stress of 800,000 psi at a race temperature of 130 F. The fatigue spalls in the silicon nitride resembled those in typical bearing steels. The ten-percent fatigue life of the silicon nitride balls was approximately one-eighth to one-fifth that of typical bearing steels (52100 and M-50). The load capacity of the silicon nitride was approximately one-third that of typical bearing steels. The load capacity of the silicon nitride was significantly higher than previously tested ceramic materials for rolling element bearings. Author

N73-15923*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE CHALLENGE TO UNIFY TREATMENT OF HIGH-TEMPERATURE FATIGUE - A PARTISAN PROPOSAL BASED ON STRAINRANGE PARTITIONING
S. S. Manson 1972 44 p refs Presented at Symp. on Fatigue at Elevated Temp., Storrs, Conn., 18-23 Jun. 1972; sponsored by Am. Soc. for Testing Mater. and ASME
(NASA-TM-X-68171; E-7060) Avail: NTIS HC $4.25 CSCL 20K

The strainrange partitioning concept divides the imposed strain into four basic ranges involving time-dependent and time-independent components. It is shown that some of the results presented at the symposium can be better correlated on the basis of this concept than by alternative methods. It is also suggested that methods of data generation and analysis can be helpfully guided by this approach. Potential applicability of the

concept to the treatment of frequency and hold-time effects, environmental influence, crack initiation and growth, thermal fatigue, and code specifications are briefly considered. A required experimental program is outlined. Author

N73-15924*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LONGITUDINAL OSCILLATION OF LAUNCH VEHICLES
Rudolf F. Glaser Washington Jan. 1973 30 p refs
(NASA-TN-D-7091; M-371) Avail: NTIS HC $3.00 CSCL 22A

During powered flight a vehicle may develop longitudinal self-excited oscillations, so-called oscillations, of its structure. The energy supplying the vibration is tapped from the thrust by the activity of the system itself; that is, oscillation of the structure causes oscillation of the propellant system, especially of the pumps. In this way an oscillating thrust can be created that, by a feedback loop, may sustain the structural oscillation under certain circumstances. Two special features of the system proved to be essential for creation of instability. One is the effect of the inherent time interval that the thrust oscillation is lagging behind the structural oscillation. The other is the decrease of system mass caused by the exhausting of gas. The latter feature may cause an initially stable system to become unstable. To examine the stability of the system, a single mass-spring model, which is the result of a one-term Galerkin approach to the equation of motion, has been considered. The Nyquist stability criterion leads to a stability graph that shows the stability conditions in terms of the system parameter and also demonstrates the significance of time lag, feedback magnitude, and loss of mass. An important conclusion can be drawn from the analysis: large relative displacements of the pump-engine masses favor instability. This is also confirmed by flight measurements. Author

N73-15925*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LIFE PREDICTION OF TURBINE COMPONENTS: ON-GOING STUDIES AT THE NASA LEWIS RESEARCH CENTER
David A. Spera and Salvatore J. Grisaffe Washington Jan. 1973 71 p refs
(NASA-TM-X-2664; E-7158) Avail: NTIS HC $3.00 CSCL 21E

An overview is presented of the many studies at NASA-Lewis that form the turbine component life prediction program. This program has three phases: (1) development of life prediction methods for major failure modes through materials studies, (2) evaluation and improvement of these methods through a variety of burner rig studies on simulated components in research engines and advanced rigs. These three phases form a cooperative, interdisciplinary program. A bibliography of Lewis publications on fatigue, oxidation and coatings, and turbine engine alloys is included. Author

N73-15926# National Physical Lab., Teddington (England).
A FURTHER AERODYNAMIC INVESTIGATION FOR THE PROPOSED HUMBER SUSPENSION BRIDGE
D. E. Walshe and C. F. Cowdrey Jun. 1972 70 p refs
(NPL-R102) Avail: NTIS HC $5.50

The sectional-model method of test was used to predict the aeroelastic behavior of proposed designs of the suspended structure. Critical wind speeds for classical flutter instability are compared with values obtained using flat plate derivatives. Time-average wind forces were measured for two designs and also on models of proposed designs of the towers. The measurements on the model towers were made in a uniform and in a sheared wind stream. It is shown that the forces measured in a sheared stream can be deduced from the measurements in uniform flow. Author

N73-15927# Defence Research Establishment Valcartier (Quebec).
IMPACT OF SOME FLAT ENDED, HIGH DENSITY, METAL CYLINDERS INTO AISI 1040 STEEL AT INTERMEDIATE VELOCITIES
O. K. Starheim , P. N. Brooks, and H. P. Tardif Sep. 1972 44 p refs
(Proj. 97-01-19)
(DREV-TN-2034/72) Avail: NTIS HC $4.25

Cylinders of various heavy metals were fired against targets of mild steel. Impact velocities were varied between 1000 and 5000 ft per second. It was found that in this velocity region, the crater volumes were highly dependent on projectile materials. For the heaviest materials, density seems to be more important than strength when considering depth of penetration in the target. The crater diameters appeared to be dependent on projectile strength in this velocity region. At higher velocities, the crater diameter becomes more sensitive to variations in target strength than to variations in projectile strength. The homologous test temperature appears to be related to the dynamic strength of materials at high rates of strain. Author

N73-15928# Central Electricity Generating Board, Berkeley (England). Nuclear Labs.
CONSTANT STRESS INTENSITY FACTOR FATIGUE CRACK PROPAGATION TESTING: DEVELOPMENT OF APPARATUS AND PRELIMINARY RESULTS
K. Jerram Aug. 1971 15 p refs
(RD/B/N-2013) Avail: AEC Depository Libraries

Automatic systems for following the progress of a fatigue crack and for carrying out constant stress intensity factor fatigue tests were developed for use in conjunction with a servo-hydraulic fatigue testing machine. The systems described are capable of carrying out tests at either constant cyclic load or constant cyclic stress intensity factor combined with either constant mean load or constant mean stress intensity factor. Author (NSA)

N73-15929# United Kingdom Atomic Energy Authority, Risley (England). Reactor Group.
SPANDE: A PRELIMINARY GUIDE TO SPACE FRAME AND PIPEWORK ANALYSIS BY MEANS OF A GENERAL PURPOSE COMPUTER PROGRAM
D. C. Davies and J. A. Enderby 1972 46 p Revised
(TRG-1409-Rev-1) Avail: AEC Depository Libraries

A general purpose program for the analysis of three dimensional frameworks, with additional refinements for pipework systems, is being developed for use on an ICL 740 computer. The immediate objective is the analysis of structural space frames and pipework systems by a method which allows a virtually unlimited number of redundancies, but other problems such as the analysis of certain asymmetric shell problems come within its scope. When used for pipework systems, the maximum shear stress in the pipe at each node and at the mid-point of each bend is quoted as part of the output data in addition to the internal forces and moments for each length, the displacements and rotations of each node and the reactions at each point of restraint. The members comprising the system being analyzed may be either straight or of constant curvature between nodes, provided that in the case of curved members one of the principal axes of the cross section of the member lies in the same plane as the member. Author (NSA)

N73-15930# Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
RESIDUAL STRESSES IN NOTCHES, RESULTING FROM VARIABLE SERVICE LOADS, AND THEIR SIGNIFICANCE FOR THE APPLICABILITY OF THE LINEAR DAMAGE ACCUMULATION HYPOTHESIS [DURCH VERAENDERLICHE BETRIEBSLASTEN IN KERBEN ERZEUGTE EIGENSPANNUNGEN UND IHRE BEDEUTUNG FUER DIE ANWENDBARKEIT DER LINEAREN SCHADENAKKUMULATIONS - HYPOTHESE]
D. Schuetz 1972 77 p refs In GERMAN Sponsored by Bundesmin. der Verteidigung
(LBF-FB-100/72) Avail: NTIS HC $6.00

The cumulative damage hypothesis is made to evaluate the maximum admissible load on structural parts where fatigue is the most important criterion. This hypothesis gives the order of magnitude for the values of the fatigue life but may lead to overestimations. In most cases this is due to local stress concentration above the limit. Tests were performed on perforated AlCuMg2 and Az 74/72 rods to clarify the situation. The internal stress was measured and a correcting element has been deduced. Author (ESRO)

N73-15931# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung

Aeroelastik.

CALCULATION OF NATURAL VIBRATIONS OF SINGLE CYLINDRICALLY CURVED OPEN SHELLS [BERECHNUNG DER EIGENSCHWINGUNGEN EINFACH KREISBOGEN-FOERMIG GEKRUEMMTER OFFENER SCHALEN]

G. Kotowski Dec. 1971 108 p refs In GERMAN; ENGLISH summary

(DLR-FB-71-92; AVA-FB-7158) Avail: NTIS HC $7.50; DFVLR, Porz, West Ger. 57 DM

The vibration behavior of cylindrically curved panels is analyzed by application of the Ritz-method, taking into account the characteristic bending vibration functions of the uniform beam to represent the plate deflections. The analytical relations are given in a general form which is valuable for arbitrary boundary conditions. For the panel clamped at one curved edge and free at the others, and for the panel clamped at all four edges, numerical results are presented and discussed in detail.

Author (ESRO)

N73-15932# Danmarks Ingeniorakademi, Alborg.

RECTANGULAR PLATES WITH LINEAR VARIATION OF THICKNESS

Olav Furnes Trondheim, Norway Norges Tekniske Vitenskapsakademi 1971 27 p refs

(PB-211229; APS-CI-73) Avail: NTIS HC $3.00; Acta Polytechnica Scandinavica Publishing Office, Box 5073, Stockholm 5 (Sweden): Sw. kr. 10.00 CSCL 13M

A method is described for analyzing elastic, rectangular plates, the thickness of which varies linearly in one direction (the y-direction), and is constant in the other direction (the x-direction). The discussion is confined to types of plates having simple supports at the edges of constant x, and arbitrary edge conditions at the edges of constant y. Author (GRA)

N73-15933# Ballistic Research Labs., Aberdeen Proving Ground, Md.

RESPONSE OF CYLINDRICAL SHELLS TO TRAVELING LOAD SIMULATION OF X-RAY BLOW-OFF IMPULSE

Norris J. Huffington, Jr. and John D. Wortman 1972 12 p refs

(AD-750336) Avail: NTIS CSCL 16/3

A procedure widely used to simulate blow-off impulse loading of shell structures (e.g., reentry vehicles or interceptor missiles) is to apply layers or strips of sheet explosive to the outside surface of the structure, usually separated from this surface by a thin attenuator layer of soft material to prevent spallation from the inner surface. Since this sheet explosive cannot be detonated simultaneously, but is initiated as a plane or curved detonation front sweeping over the structure, some concern has been felt as to whether this procedure will produce the same structural response as the simultaneously applied X-ray loading which it is intended to simulate. A study was conducted in which the responses of fixed-ended cylinders to a frontal cosine distribution of impulse intensity were calculated for three cases: a load pulse initiated simultaneously on the entire frontal half of a cylinder, a plane detonation front sweeping longitudinally and a plane detonation front sweeping circumferentially.

Author (GRA)

N73-15934# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.

LATERAL BENDING TORSION VIBRATIONS OF A THIN BEAM UNDER PARAMETRIC EXCITATION

John Dugundji and Vivekananda Mukhopadhyay Jun. 1972 42 p refs

(Contract F44620-69-C-0091; AF Proj. 9782)

(AD-750546; AFOSR-72-2007TR; ASRL-TR-159-4) Avail: NTIS CSCL 20/11

A thin plate-like cantilever beam, well below static lateral buckling under gravity, is subjected to vertical harmonic excitation of its base. The governing equations reduce to systems of two Mathieu equations coupled mainly by symmetric, off-diagonal parametric excitation terms. For such cases, the primary instability regions are shown to occur near forcing frequencies (omega sub F) = (omega sub i) + (omega sub j), with each mode oscillating at its own natural frequency, omega sub i. Experiments performed on an actual beam confirm this behavior. Since the beam had nonlinear damping, the instability regions settled down to steady limit cycles whose frequencies and amplitudes were well predicted by theory. The simultaneous excitation of two modes, each oscillating at its own natural frequency, may be of considerable interest in vibration testing of actual structures.

Author (GRA)

N73-15935# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.

A NEW THEORY OF SPHERICAL SHELLS WITH CRACKS

G. C. Sih and H. C. Hagendorf Jul. 1972 51 p refs Presented at the Symp. on Thin Shell Structures, held at Calif. Inst. of Tech., Pasadena, 29-30 Jun. 1972

(Contract N00014-68-A-0514)

(AD-749966; IFSM-72-21; TR-72-3-ONR) Avail: NTIS CSCL 20/11

An improved theory of shallow spherical shells which includes the effect of transverse shear deformation is derived. The resulting tenth order system of equations are uncoupled and all five boundary conditions along an edge of the shell can be satisfied. The method of integral transforms is used to formulate and solve the symmetric problem for a spherical shell containing a finite meridional crack. The stress field in the neighborhood of the crack tip is obtained. In contrast to the classical shallow shell theory, the angular variation of the stress resultants coincide with that of the stretching, and the Reissner theory of bending of thin plates so that a combined stress-intensity factor can be defined. Author (GRA)

N73-15936# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE INVESTIGATION OF STRESSES IN A COMPRESSOR BLADE FOIL

V. B. Gorlov 4 Aug. 1972 12 p refs Transl. into ENGLISH from the Publ. "Trudy, 5-y Vsesoyoznoy Konferentsii, 23-27 Iyunya 1964. Polyarizatsionno- Opticheskiy Metod Issledovaniya Napryazheniy" Leningrad Univ., 1966 p 330-334

(AF Proj. 668A)

(AD-750497; FTD-MT-24-12-72) Avail: NTIS CSCL 13/7

The paper contains the results of an investigation of stresses in compressor rotors and blades. Specifically, the stresses in dove tail joints (two dimensional problem) and the key end of a compressor blade with a considerable natural twist (three dimensional problem) were evaluated. A model of the rotor was constructed using a special alloy. The stresses between the blade slots on the rotor were measured using an optical polarization method. The distortion of a grid pattern after the test was used to measure the strain. Author (GRA)

N73-15937# California Univ., La Jolla. Dept. of Applied Mechanics and Engineering Sciences.

TWO-DIMENSIONAL ELASTIC STRESSES AROUND A CRACK NORMAL TO AN INTERFACE

Noel E. Ashbaugh Aug. 1972 26 p refs

(Grant AF-AFOSR-1957-70; AF Proj. 9782)

(AD-750498; AFOSR-72-2005TR; TR-7) Avail: NTIS CSCL 11/4

Mode 2 or shearing mode stress intensity factors are determined for a finite length crack in a bimaterial composite. The crack is in one of the elastic materials and is perpendicular to an interface between the two bonded dissimilar materials of the composite. The mode 2 factors, together with previously obtained mode 1 factors, furnish the complete two-dimensional description of the stresses around the crack tips for in-plane loads on the composite. Numerical results for the stress intensity factors are presented for a stress-free crack which occurs in a region of uniform stress. Author (GRA)

N73-15938# General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.

EFFECTS OF LATERAL INERTIA ON THE PROPAGATION OF ELASTIC-PLASTIC WAVES

C. H. Mok Jul. 1972 123 p refs

(Contract DAAD05-70-C-0224)

(AD-750102; BRL-CR-70) Avail: NTIS CSCL 20/11

A simplified theory, taking into account the effects of lateral or radial inertia, is described for the study of the propagation of elastic-plastic waves in a slender rod. This approximate theory, which is developed through an approach similar to that used by

Hermann and Mindlin in their study of elastic-wave propagation, yielded results that show qualitative agreement with some preliminary BRL experimental observations and with other past theoretical and experimental results. Author (GRA)

N73-15939# Lockheed-Georgia Co., Marietta.
DEVELOPMENT OF AN UNDERSTANDING OF THE FATIGUE PHENOMENA OF BONDED AND BOLTED JOINTS IN ADVANCED FILAMENTARY COMPOSITE MATERIALS. VOLUME 1: ANALYSIS METHODS Final Technical Report, Aug. 1970 - Apr. 1972
John N. Dickson, Teh-Min Hsu, and James M. McKinney Wright-Patterson AFB, Ohio AFFDL Jun. 1972 136 p refs
(Contract F33615-70-C-1302; AF Proj. 4364)
(AD-750132; LGR-ER-11319-Vol-1; AFFDL-TR-72-64-Vol-1) Avail: NTIS CSCL 13/5

This is Volume 1 of a final report presented in three volumes. This volume describes the analytical methods that were generated or used as part of this program. The volume is divided as follows: Closed Form Analysis Methods, Finite Element Analysis, Photoelastic Stress Analysis. Emphasis was placed on the development of closed form analysis procedures for bonded joints in laminated composites. A comprehensive linear analysis method and associated computer program (BONJO 1) has been developed. Numerical results obtained with this program are compared with finite element analyses, strain gage data and photoelastic results. Finite element analyses used to evaluate the step lap bonded joints and bolted joints are presented and discussed. Photoelastic stress analysis procedures used in the program are described in the final chapter together with the results obtained.
Author (GRA)

N73-15940# Lockheed-Georgia Co., Marietta.
DEVELOPMENT OF AN UNDERSTANDING OF THE FATIGUE PHENOMENA OF BONDED AND BOLTED JOINTS IN ADVANCED FILAMENTARY COMPOSITE MATERIALS. VOLUME 2: FABRICATION, INSPECTION AND TESTING Final Technical Report, Aug. 1970 - Apr. 1972
Albert C. Fehrle, Gerald J. Gilbert, Edward C. Young et al Wright-Patterson AFB, Ohio AFFDL Jun. 1972 334 p
(Contract F33615-70-C-1302; AF Proj. 4364)
(AD-750133; LGR-ER-11319-Vol-2; AFFDL-TR-72-64-Vol-2) Avail: NTIS CSCL 13/5

Fabrication and inspection methods were established which resulted in specimens of uniform high quality fabricated to close tolerances. Both bonded and bolted joints of widths from one to ten inches were evaluated. Primary emphasis was on joints in boron-epoxy, and between boron-epoxy and titanium or aluminum; however limited evaluations of graphite-epoxy/titanium and fiberglass-epoxy/titanium were included. Joint configurations evaluated were: single and double splice butt joints; boron-epoxy to metal stepped single scarf joints; and surface to understructure attachments. All laminates and specimens were inspected non-destructively. Base material properties and process control measures were verified by destructive testing. Developing testing techniques and actual specimen testing was a major portion of the program. Author (GRA)

N73-15941# Lockheed-Georgia Co., Marietta.
DEVELOPMENT OF AN UNDERSTANDING OF THE FATIGUE PHENOMENA OF BONDED WITH BOLTED JOINTS IN ADVANCED FILAMENTARY COMPOSITE MATERIALS. VOLUME 3: FATIGUE ANALYSIS AND FATIGUE MODE STUDIES Final Technical Report, Aug. 1970 - Apr. 1972
Albert C. Fehrle, James R. Carroll, Samuel M. Freemen et al Wright-Patterson AFB, Ohio AFFDL Jun. 1972 269 p refs
(Contract F33615-70-C-1302; AF Proj. 4364)
(AD-750134; LGR-ER-11319-Vol-3; AFFDL-TR-72-64-Vol-3) Avail: NTIS CSCL 13/5

The report presents the results of the empirical program undertaken to increase the basic understanding of the fatigue phenomena of advanced composite joints. Four basic design concepts were evaluated and include both bonded and mechanically fastened joints. A broad spectrum of joint geometry variations and loading conditions are included to identify the significant parameters affecting the fatigue endurance of composite joints. Test data and analyses are included for constant amplitude testing and program fatigue loading. Realistic spectrum and block spectrum data are evaluated using Miners Cumulative Damage Theory. In conjuction with other analyses and evaluations, failure mode studies were conducted on the fracture surface of failed specimens. Scanning electron microscope (SEM) photomicrographs were used for this failure study. Author (GRA)

N73-15942# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Aerospace Engineering and Applied Mechanics.
ANALYSIS OF A PERFORATED CIRCULAR CYLINDRICAL SHELL SUBJECTED TO AXIAL TENSION, EDGE MOMENT OR TRANSVERSE SHEAR
Richard Mondello and Martin A. Goldberg Sep. 1972 91 p refs
(Contract F44620-69-C-0072; AF Proj. 9782)
(AD-750942; PIBAL-72-29; AFOSR-72-2062TR) Avail: NTIS CSCL 20/11

The method of least square point matching is employed in the analysis of a shallow, circular cylindrical shell with a cutout. The cylinder may be infinite or semi-infinite, and the cutout is either circular or elliptic. For the ellipse the major axis can be oriented either parallel or perpendicular to the generator. In particular, two examples are presented: an infinite cylinder subjected to uniform axial tension, and a semi-infinite cylinder loaded at its edge by either a uniform bending moment or a transverse shear force. In both cases the minor axis of the elliptic cutout is parallel to the generator. The boundary of the perforation is free of tractions and supports. Numerical results are presented and show the effects of variations in: the hole size to cylinder curvature ratio; the eccentricity of the cutout; and for semi-infinite cylinders, the distance from the cutout to the edge. Author (GRA)

N73-15943# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
ANALYSIS OF THE BUCKLING OF AN ELASTIC PLATE FLOATING ON WATER AND STRESSED UNIFORMLY ALONG THE PERIPHERY OF AN INTERNAL HOLE Final Report, 1 Mar. - 30 Jun. 1972
Shunsuke Takagi Sep. 1972 33 p refs
(AD-750594; AROD-I-466-1-E) Avail: NTIS CSCL 20/11

The problem can be reduced to an eigenvalue problem of a fourth order ordinary differential equation in a semi-infinite region. The series that satisfied the boundary condition at infinity is asymptotic, which cannot satisfy the boundary condition at a finite point and fails to yield the eigenvalues. Theoretically this difficulty can be overcome, as explained in this report, by converting the divergent asymptotic series to a convergent factorial series. Author (GRA)

N73-15944# California Univ., Los Angeles. School of Engineering and Applied Science.
DYNAMIC FRACTURE TOUGHNESS DETERMINED FROM INSTRUMENTED PRE-CRACKED CHARPY TESTS
William Leon Server Aug. 1972 107 p refs
(Contract DAHC04-69-C-0008)
(AD-750710; UCLA-ENG-7267; AROD-8016-7-MC) Avail: NTIS CSCL 14/2

The use of an instrumented impact hammer on pre-cracked Charpy V-notch specimens led to a reliable and inexpensive method for determining dynamic fracture toughness. Measurements were made on A-533, Grade B, Class 1 steel from -125F to -75F. The data were found to be in excellent agreement with those obtained by other workers on much larger specimens. Similar tests were run with standard Charpy V-notch specimens to determine dynamic tensile yield strength values. A comparison of the dynamic yield and toughness values suggests a meaningful technique for estimating the NDT temperature, which should be of practical value in nuclear reactor surveillance programs.
Author (GRA)

N73-15945# Watervliet Arsenal, N.Y.
THE METHODS OF RITZ, GALERKIN, AND COMPLEMENTARY ENERGY APPLIED TO SOME NONCONSERVATIVE PROBLEMS OF ELASTIC STABILITY
Gary L. Anderson Jul. 1972 46 p refs
(DA Proj. 1F0-61102-A-35-D)
(AD-750575; WVT-7236) Avail: NTIS CSCL 20/11

The well-known problem of Beck and two problems due to Hauger which arise in the theory of nonconservative elastic stability are reconsidered. Approximate values of the respective critical loads are computed by means of the methods of Ritz, Galerkin, and complementary energy in conjunction with a formal variational expression and the adjoint variational principle. For these examples, it was found that the speed of convergence of the procedures is somewhat better in the case of the method of complementary energy, but the Galerkin procedure is probably the simplest to apply. The numerical calculations demonstrate that the previously published values of the critical load intensity for Hauger's two problems are about 5% and 28% too high.
Author (GRA)

N73-15946*# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ALL UNION CONFERENCE ON THE THEORY OF PLATES AND SHELLS (SELECTED ARTICLES)
23 Jun. 1972 97 p refs Transl. into ENGLISH from the publ. "Vsesoyuznaya Konferentsiya po Teorii Plastin i Obolochek, Vol. " USSR, 1960
(AF Proj. 6010606)
(AD-750991; FTD-HT-23-101-72) Avail: NTIS CSCL 20/11

Contents: Bending of a thin rectangular cantilever plate by an arbitrarily distributed transverse load; Large bends of a rectangular plate under the action of uniform normal pressure with uneven heating, hydrodynamic forces appearing at a dynamic loss of stability in cylindrical shells immersed in a fluid; Solutions in special functions to problems of nonsymmetric deformation of mildly sloping spherical and conical shells; One method of solving systems of nonlinear finite-difference equations describing the bending of plates; Application of the method of series approximations to the study of large deflections of a circular plate and a very mildly sloping spherical segment; Stability of cylindrical shells immersed in a fluid during short dynamic loads; Dynamic stability of a circular cylindrical shell under the action of a wave impact load; Toward a theory of plates of average thickness. GRA

N73-15947# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AMPLITUDE ANALYSIS OF RANDOM PROCESSES WITH CYCLICAL STRESSES
B. Z. Slobin 7 Aug. 1972 18 p refs Transl. into ENGLISH from Mashinovedenie (USSR), no. 1, 1971 p 59-64
(AD-750908; FTD-MT-24-289-72) Avail: NTIS CSCL 20/11

The principle of amplitude analysis (breakdown into elementary cycles) is formulated for the realizations of a wideband random process in connection with the problem of the mechanical fatigue of structures acted upon by random forces. An approximate solution is obtained for the amplitude distribution of the elementary cycles of a normal steady state wide band process, the solution being valid for large amplitude values. Author (GRA)

N73-15669 Joint Publications Research Service, Arlington, Va.
NONUNIFORMITY OF THE RADIAL ELASTIC FIELD OF SYMMETRICAL SPRINGS
A. S. Kelzon, A. P. Zobnin, and K. K. Malinovskiy *In its* Inertial Guidance Equipment 12 Dec. 1972 p 23-27 refs (For availability see N73-15664 06-21)

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N73-15948*# Alabama Univ., Huntsville.
THERMAL ELASTOPLASTIC STRUCTURAL ANALYSIS OF NON-METALLIC THERMAL PROTECTION SYSTEMS Final Technical Report
T. J. Chung and G. Yagawa Aug. 1972 78 p refs
(Contract NAS8-27792)
(NASA-CR-124005; UARI-126) Avail: NTIS HC $6.00 CSCL 20M

An incremental theory and numerical procedure to analyze a three-dimensional thermoelastoplastic structure subjected to high temperature, surface heat flux, and volume heat supply as well as mechanical loadings are presented. Heat conduction equations and equilibrium equations are derived by assuming a specific form of incremental free energy, entropy, stresses and heat flux together with the first and second laws of thermodynamics, von Mises yield criteria and Prandtl-Reuss flow rule. The finite element discretization using the linear isotropic three-dimensional element for the space domain and a difference operator corresponding to a linear variation of temperature within a small time increment for the time domain lead to systematic solutions of temperature distribution and displacement and stress fields. Various boundary conditions such as insulated surfaces and convection through uninsulated surface can be easily treated. To demonstrate effectiveness of the present formulation a number of example problems are presented. Author

N73-15949*# Lockheed Missiles and Space Co., Huntsville, Ala.
RESULTS OF A SPACE SHUTTLE PLUME IMPINGEMENT INVESTIGATION AT STAGE SEPARATION IN THE NASA-MSFC IMPULSE BASE FLOW FACILITY
R. W. McCanna and W. H. Sims Jul. 1972 328 p refs
(Contract NAS8-26801)
(NASA-CR-124000; LMSC/HREC-D225839) Avail: NTIS HC $18.50 CSCL 20M

Results are presented for an experimental space shuttle stage separation plume impingement program conducted in the NASA-Marshall Space Flight Center's impulse base flow facility (IBFF). Major objectives of the investigation were to: (1)determine the degree of dual engine exhaust plume simulation obtained using the equivalent engine; (2) determine the applicability of the analytical techniques; and (3) obtain data applicable for use in full-scale studies. The IBFF tests determined the orbiter rocket motor plume impingement loads, both pressure and heating, on a 3 percent General Dynamics B-15B booster configuration in a quiescent environment simulating a nominal staging altitude of 73.2 km (240,00 ft). The data included plume surveys of two 3 percent scale orbiter nozzles, and a 4.242 percent scaled equivalent nozzle - equivalent in the sense that it was designed to have the same nozzle-throat-to-area ratio as the two 3 percent nozzles and, within the tolerances assigned for machining the hardware, this was accomplished. Author

N73-15950*# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
CRYOGENIC RESEARCH AND DEVELOPMENT Progress Reort, period ending 30 Sep. 1972
R. J. Richards and G. H. Wallice 30 Sep. 1972 25 p
(NASA Order W-13300)
(NASA-CR-130362; PR-47; NBS-10-760) Avail: NTIS HC $3.25 CSCL 20M

Cryogenics research progress is reported for: (1) slush hydrogen heat transfer; and (2) hydrocarbon suspension. A.L.

N73-15951# National Engineering Lab., East Kilbride (Scotland).
THE HEAT PIPE: A LIST OF PERTINENT REFERENCES
Jean McKechnie, comp. Mar. 1972 46 p refs
(Bib-2-72) Avail: NTIS HC $4.50

This bibliography contains 544 references obtained from a literature survey on heat pipes. A.L.

N73-15952*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LOCAL HEAT-TRANSFER CHARACTERISTICS OF A ROW OF CIRCULAR AIR JETS IMPINGING ON A CONCAVE SEMICYLINDRICAL SURFACE
John N. B. Livingood and James W. Gauntner Washington Jan. 1973 26 p refs
(NASA-TN-D-7127; E-7117) Avail: NTIS HC $3.00 CSCL 20M

An experimental study was made of the local heat-transfer characteristics of air jets impinging on the concave side of a right circular semicylinder. A correlation was developed for expressing individual and combined effects of a number of

dimensionless variables on the normalized Nusselt number distributions. Results of the present study are in good agreement with those of other investigators. Author

N73-15953*# National Bureau of Standards, Boulder, Colo. Cryogenic Div.
THERMOPHYSICAL PROPERTIES OF HELIUM-4 FROM 2 TO 1500 K WITH PRESSURES TO 1000 ATMOSPHERES
R. D. McCarty Nov. 1972 161 p refs
(NASA Order T-1813A)
(NBS-TN-631) Avail: NTIS MF $0.95; SOD HC $1.25 as C13.46:631 CSCL 20M

Tables of thermophysical properties of helium 4 are presented for temperatures from 2 to 1500 K for pressures to 1000 atmospheres. The tables include entropy, enthalpy, internal energy, density, volume, speed of sound, specific heat, thermal conductivity, viscosity, thermal diffusivity, Pradtl number and the dielectric constant for 62 isobars. Also included in the isobaric tables are quantities of special utility in heat transfer calculations. In additional to the isobaric tables, tables for the saturated vapor and liquid are given which include all of the above properties, plus the surface tension. Tables for the P rho T of the freezing liquid, P rho T of the lambda line, index of refraction and the derived Joule-Thomson inversion curve are also presented. A computer program to calculate the various properties is also available. Author

N73-15954*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FORTRAN 4 COMPUTER PROGRAM FOR CALCULATION OF THERMODYNAMIC AND TRANSPORT PROPERTIES OF COMPLEX CHEMICAL SYSTEMS
Roger A. Svehla and Bonnie J. McBride Washington Jan. 1973 178 p refs
(NASA-TN-D-7056; E-6514) Avail: NTIS HC $3.00 CSCL 20M

A FORTRAN IV computer program for the calculation of the thermodynamic and transport properties of complex mixtures is described. The program has the capability of performing calculations such as:(1) chemical equilibrium for assigned thermodynamic states, (2) theoretical rocket performance for both equilibrium and frozen compositions during expansion, (3) incident and reflected shock properties, and (4) Chapman-Jouguet detonation properties. Condensed species, as well as gaseous species, are considered in the thermodynamic calculation; but only the gaseous species are considered in the transport calculations. Author

N73-15955*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXACT ANALYTICAL SOLUTION TO A TRANSIENT CONJUGATE HEAT-TRANSFER PROBLEM
James Sucec Washington Jan. 1973 36 p refs
(NASA-TN-D-7101; E-7090) Avail: NTIS HC $3.00 CSCL 20M

An exact analytical solution is found for laminar, constant-property, slug flow over a thin plate which is also convectively cooled from below. The solution is found by means of two successive Laplace transformations when a transient in the plate and the fluid is initiated by a step change in the fluid inlet temperature. The exact solution yields the transient fluid temperature, surface heat flux, and surface temperature distributions. The results of the exact transient solution for the surface heat flux are compared to the quasi-steady values, and a criterion for the validity of the quasi-steady results is found. Also the effect of the plate coupling parameter on the surface heat flux are investigated. Author

N73-15956*# Techtran Corp., Glen Burnie, Md.
THEORY OF COMBUSTION OF UNMIXED GASES
Ya. B. Zeldovich Washington NASA Jan. 1973 19 p refs Transl. into ENGLISH from Zh. Tekh. Fiz. (USSR), v. 19, no. 10, 1949 p 1199-1210
(Contract NASw-2485)
(NASA-TT-F-14360) Avail: NTIS HC $3.00 CSCL 21B

The distribution of the concentration products and temperature is discussed in the combustion of mixed gases. It is shown that in the simplest conditions these concentrations and temperature at the surface of a flame are the same as in the combustion of previously prepared stoichiometric mixtures of the same gases. A possible limit was found to the intensification of combustion of unmixed gases, depending upon the limiting rate of the chemical reaction. In order of magnitude, this limit is close to the rate of combustion of stoichiometric mixtures. Author

N73-15957*# TRW Systems Group, Redondo Beach, Calif.
THEORY AND DESIGN OF VARIABLE CONDUCTANCE HEAT PIPES: STEADY STATE AND TRANSIENT PERFORMANCE
D. K. Edwards, G. L. Fleischman, and B. D. Marcus Dec. 1972 116 p refs
(Contract NAS2-5503)
(NASA-CR-114530; Rept-3) Avail: NTIS HC $8.00 CSCL 20M

Heat pipe technology pertinent to the design and application of self-controlled, variable conductance heat pipes for spacecraft thermal control is discussed. Investigations were conducted to: (1) provide additional confidence in existing design tools, (2) to generate new design tools, and (3) to develop superior variable conductance heat pipe designs. A computer program for designing and predicting the performance of the heat pipe systems was developed. Author

N73-15958*# McDonnell-Douglas Astronautics Co., Richland, Wash.
INVESTIGATION OF BUBBLES IN ARTERIAL HEAT PIPES
E. W. Saaski Dec. 1972 89 p refs
(Contract NAS2-6991)
(NASA-CR-114531) Avail: NTIS HC $6.50 CSCL 20M

The behavior of gas occlusions in arterial heat pipes has been studied experimentally and theoretically. Specifically, the gas-liquid system properties, solubility and diffusivity, have been measured from -50 to 100 C for helium and argon in ammonia, Freon-21 (CHC12F), and methanol. Properties values obtained were then used to experimentally test models for gas venting from a heat pipe artery under isothermal conditions (i.e., no-heat flow), although the models, as developed, are also applicable to heat pipes operated at power, with some minor modifications. Preliminary calculations indicated arterial bubbles in a stagnant pipe require from minutes to days to collapse and vent. It has been found experimentally that a gas bubble entrapped within an artery structure has a very long lifetime in many credible situations. This lifetime has an approximately inverse exponential dependence on temperature, and is generally considerably longer for helium than for argon. The models postulated for venting under static conditions were in general quantitative agreement with experimental data. Factors of primary importance in governing bubble stability are artery diameter, artery wall thickness, noncondensible gas partial pressure, and the property group (the Ostwald solubility coefficient multiplied by the gas/liquid diffusivity). Author

N73-15959*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARISON OF PRIMARY ZONE COMBUSTOR LINER WALL TEMPERATURES WITH CALCULATED PREDICTIONS
Carl T. Norgren Washington Jan. 1973 26 p refs
(NASA-TM-X-2711; E-7172) Avail: NTIS HC $3.00 CSCL 20M

Calculated liner temperatures based on a steady-state radiative and convective heat balance at the liner wall were compared with experimental values. Calculated liner temperatures were approximately 8 percent higher than experimental values. A radiometer was used to experimentally determine values of flame temperature and flame emissivity. Film cooling effectiveness was calculated from an empirical turbulent mixing expression assuming a turbulent mixing level of 2 percent. Liner wall temperatures were measured in a rectangular combustor segment 6 by 12 in. and tested at pressures up to 26.7 atm and inlet temperatures up to 922 K. Author

N73-15960# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.
DESIGN CONSIDERATIONS OF HEAT EXCHANGERS FOR VAPORIZING FLUIDS

S. Fabrega, J. Huyghe, and R. Ricque 1971 13 p refs In FRENCH Presented at the Intern. Conf. on Heat Exchangers, Paris, 16-18 Jun. 1971
(CEA-Conf-2010; Conf-710651-2) Avail: AEC Depository Libraries

Aspects of determining the steady state operating characteristics of certain types of vapor generating equipment are examined. A type of equipment considered is the vertical tube reboiler with upward flow. A calculation method applicable to industrial mixtures is described, wherein the evolution of mixture composition along the tube is accounted for. Based on results obtained with an experimental unit of this type, and attempt was made to develop correlations for the pressure drop and the heat transfer rate that would apply at relatively low pressures (a few bars). Also discussed are falling film, long tube vertical evaporators, and a boiling system often found in industrial situations. Methods and results are presented that permit predictions of the heat transfer coefficient and the pressure drop. Aspects of boiling outside horizontal or vertical tubes are considered in connection with the operation of low pressure boilers often encountered in seawater desalting units (sub-atmospheric pressures) and in the chemical industry. Author (NSA)

N73-15961# Houston Univ., Tex. Dept. of Mechanical Engineering.
VAPOR EXPLOSION HEAT TRANSFER AND FRAGMENTATION. 5: INVESTIGATION OF THE VAPOR EXPLOSION PHENOMENON USING A MOLTEN-METAL JET INJECTED INTO DISTILLED WATER
R. H. Bradley, L. C. Witte, and J. E. Cox Oct. 1971 91 p refs
(Contract AT(40-1)-3936)
(ORO-3936-7) Avail: NTIS

In this investigation, a 1/6-inch dia. molten metal jet was injected into a tank of subcooled distilled water. Four low melting-point metals were used; mercury, Asarcolo-158 (a low-melting-point fusible alloy), 50-50 lead-tin alloy, and tin. High-speed photography was used to study the jet-coolant interaction. This investigation shows that previously proposed theories for the causative mechanisms for explosive interaction are not adequate for a jet system. The experimental conditions were controlled so that hydrodynamic instability effects were minimized. Neither solidification of molten metal nor vapor production is necessary for fragmentation to occur. A dimensional analysis of the problem indicates that there is a parameter that involves primarily thermally controlled variables that may control fragmentation. Experimental observations tend to support a thermally controlled mechanism. Author

N73-15962# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Aachen (West Germany). Inst. fuer Theoretische Gasdynamik.
UNSTEADY REACTION WAVES [INSTATIONAERE REAKTIONSFRONTEN]
Fritz Bartlmae Jun. 1971 66 p refs In GERMAN; ENGLISH summary
(DLR-FB-71-66) Avail: NTIS HC $5.50; DFVLR, Porz, West. Ger. 18,60 DM

The fundamentals of the theory for unsteady, one-dimensional reaction waves are dealt with in detail. Their velocity, which is strongly temperature dependent, is coupled with the state of the unburned mixture by reaction kinetics. For the typical case of turbulent combustion of a propane-air mixture, a simple flame-propagation law is derived in order to examine the feedback between chemical reaction and flow field. The application of the theory, which permits closed analytical solutions in many cases by means of suitable linearization, is demonstrated for an accelerating flame front in a tube. Author (ESRO)

N73-15963# Pratt and Whitney Aircraft, West Palm Beach, Fla. Research and Development Center.
INVESTIGATION OF DAMPING METHODS FOR AUGMENTOR COMBUSTION INSTABILITY Final Technical Report, 1 Mar. 1971 - 31 Oct. 1972
Gary D. Garrison and P. L. Russell Wright-Patterson AFB, Ohio AFAPL Oct. 1972 101 p refs
(Contract F33615-71-C-1361; AF Proj. 3066)
(AD-750902; PWA-FR-5163; ; AFAPL-TR-72-84) Avail: NTIS CSCL 21/2

Absorbing liners or screech liners are commonly used in the augmentors currently being proposed and developed can experience low frequency instabilities for which liners of conventional design are an impractical solution because of the unacceptably large volumes required for the linear resonator cavity. The objective of this program was to develop practical augmentor acoustic devices for controlling low frequency combustion instabilities. Analysis, supported by cold flow impedance experiments, indicated that dimpled array liners, i.e., liners with punched and therefore lengthened apertures, complex-porous liners having facings of two different porous materials in series, and acoustic energy absorbing flameholders could provide sufficient abosrption. Author (GRA)

N73-15964# Air Force Office of Scientific Research, Arlington, Va.
COMPILATION OF ABSTRACTS: 8TH AFOSR COMBINED CONTRACTORS MEETING ON COMBUSTION DYNAMICS RESEARCH
Hyla S. Napadensky 14 Aug. 1972 63 p refs Conf. held at Chicago, Ill., 14-18 Aug. 1972
(AD-750466; AFOSR-72-0653TR) Avail: NTIS CSCL 21/2

The report consists of a collection of abstracts of the numerous research progress reports given by AFOSR contractors. These papers presented over a five-day period composed the 8th Annual Meeting of Combustion Dynamics Research. Each paper was grouped under one of the three major subject headings; Advanced Air Breathing Combustion; Liquid Propellant Rocket Combustion; or Solid Propellant Rocket Combustion. The principal investigators and their organizational association are also identified. Author (GRA)

34 GENERAL

Includes information of a broad nature related to industrial applications and technology, and to basic research; defense aspects; information retrieval; management; law and related legal matters; and legislative hearings and documents.

N73-15965# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 290
18 Dec. 1972 24 p refs Transl. into ENGLISH from various Eastern European publications
(JPRS-57792) Avail: NTIS HC $3.25

Articles are presented concerning the role and activities of the Hungarian National Bureau of Metrology and the use of photogrammetry in city planning and modernization. For individual titles, see N73-15966 through N73-15967.

N73-15966 Joint Publications Research Service, Arlington, Va.
ROLE, ACTIVITIES OF NATIONAL BUREAU OF METROLOGY DEFINED c11
Tibor Pataky *In its* Transl. on Eastern Europe: Sci. Affairs, No. 290 18 Dec. 1972 p 1-12 Transl. into ENGLISH from Finomechanika (Budapest), v. 11, no. 10, 1972 p 296-303 (For availability see N73-15965 06-34)

The design and scope of operations are described for the National Bureau of Metrology (NBM). The information presented includes: (1) activities and relationships of the NBM; (2) organizational structure; and (3) the specialized laboratories of the NBM, their field of activity, and the precision of their measurements. D.L.G.

N73-15967 Joint Publications Research Service, Arlington, Va.
PHOTOGRAMMETRY IN CITY PLANNING AND MODERNIZATION c14
G. Anculete *In its* Transl. on Eastern Europe: Sci. Affairs, No. 290 18 Dec. 1972 p 13-21 refs Transl. into ENGLISH from Terra (Bucharest), no. 5, Sep. - Oct. 1972 p 10-16 (For availability see N73-15965 06-34)

The role of aerial photography and photogrammetry in urban planning are discussed along with other equally modern techniques

which are now being utilized. The technologies involved and the areas of application are dealt with as well as the benefits to be derived. It is pointed out that, if the information offered by photogrammetry and the other auxiliary techniques of remote detection are transposed into maps or transparent graphs, we can more realistically deduce the modernization deficiencies of our cities and arrive at practical solutions. D.L.G.

N73-15968# Advisory Group for Aerospace Research and Development, Paris (France).
THE VON KARMAN LECTURE. LESSONS LEARNED AND FUTURE DIRECTIONS IN THE MANAGEMENT OF TECHNICAL PROGRAMS
Robert C. Seamans Sep. 1972 36 p Lecture held at Brussels, 28 Sep. 1972
Avail: NTIS HC $4.00

Advances in technology management, learned at NASA and DOD, are briefly reviewed. The NASA programs involved feedback from the customer, accurate assessment and control using detailed schedules of tasks and costs, and a three-way balance between performance, schedule, and cost. The defense management added the condition that new systems must also be produced and operated in large numbers. Illustrations are given using major new weapon/aircraft systems. Competitive prototyping and future directions in military programs are described, along with the application of aerospace technology to civil needs. It is concluded that NATO countries must look for better ways to provide effective defense forces and meet growing civil needs. Improved technology management is of critical importance, and proptotype programs must be carefully selected with a minimum of duplication. Papers on the challenge facing NATO, the future of defense cooperation among NATO nations, and technical cooperation among NATO nations are appended. N.E.N.

N73-15969# Massachusetts Inst. of Tech., Cambridge. Urban Systems Lab.
SUMMARY OF NATIONAL TRANSPORTATION STATISTICS
Nov. 1972 116 p refs
(Contract DOT-OS-10058)
Avail: NTIS HC $8.00

Summaries of selected national transportation statistics covering the years 1960 to 1970 are presented in the three displays, modal profiles, and transportation trends. In general, the data are divided into cost, inventory, and performance. Supplementary data are presented on transportation and the economy and on transportation, energy, and the environment. Water and noise pollution are also considered. N.E.N.

N73-15970# California Univ., Berkeley. Lawrence Berkeley Lab. Inorganic Materials Research Div.
[CHEMISTRY, METALLURGY, CERAMIC SCIENCE AND SOLID STATE PHYSICS] Annual Report, 1971
Apr. 1972 202 p refs
(Contract W-7405-eng-48)
(LBL-425) Avail: NTIS

Research progress is reported in chemistry, metallurgy, ceramic science and solid state physics. A separate abstract is included for each section. NSA

N73-15971# CONSAD Research Corp., Pittsburgh, Pa.
A COMMUNITY/AIRPORT ECONOMIC DEVELOPMENT MODEL. VOLUME 3: USER'S MANUAL Final Report, Apr. 1971 - May 1972
Jere J. Hinkle May 1972 209 p
(Contract DOT-FA71WA-2565)
(FAA-EQ-72-3-Vol-3) Avail: NTIS HC $12.50

A description of the operations of the Community/Airport Economic Development Model is presented. Information is given in both narrative and graphic form regarding the kind of input that is required to be provided by the user of the program. The options that are available within the program and the format and ordering of the data that are required for program operation are given. Sample outputs are included. Author

N73-15972# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES, VOLUME 26, NO. 9
John M. Leonard, ed. and Victoria Hewitson, ed. 29 Sep. 1972 33 p
(AD-750267) Avail: NTIS CSCL 05/2

Presents materials on combustion research, physiology, polymers, helicopter icing, salaries of instructors, marine cargo carriers, research in Japan, icebreakers, electronics engineering, metallurgy, computer aided design, oceanology, spectroscopy, and marine biology. GRA

N73-15973# Office of the Chief of Research and Development (Army), Washington, D.C.
PROCEEDINGS OF THE 1972 ARMY SCIENCE CONFERENCE. VOLUME 1: KEYNOTE ADDRESS, INVITED PAPERS, PRINCIPAL AUTHORS A THROUGH G
23 Jun. 1972 357 p refs Conf. held at West Point, N. Y., 20-23 Jun. 1972 2 Vol.
(AD-750300) Avail: NTIS CSCL 05/2

The report is a compilation of achievements, researches, and exploratory developments in military sciences. Technological assessment of research and development projects, leading to the technology transfer of endeavors, is made. This volume is limited to principal authors alphabetized A thru G.
Author (GRA)

N73-15974# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of System and Logistics.
AN EVALUATION OF THE COST EFFECTIVENESS OF TRANSPORTING AIR ELIGIBLE CARGO BY AIR VERSUS SURFACE MODES OF TRANSPORTATION M.S. Thesis
Forrest H. Bennett, Jr. and Charles H. Abel 15 Sep. 1972 104 p refs
(AD-750848; SLSR-26-72B) Avail: NTIS CSCL 15/5

Transportation priority 1 and 2 air eligible cargo is being moved from the AFCL Air Materiel Areas to CONUS on-line LOGAIR stations by surface modes. An arbitrary limit of one LOGAIR flight per station per day imposed a ceiling on the daily capability of the LOGAIR system. The increased pipeline intransit time resulting from use of the surface modes forces a set level of inventory investment. The procurement of additional LOGAIR capability reduces the overall transportation priority 1 and 2 cargo pipeline intransit time and therefore reduces the inventory investment. The thesis proposes a method to offset the increased costs of procuring additional airlift through a reduction in inventory investment. Author (GRA)

N73-15975# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
A STUDY OF THE F-15 CONTRACT STRUCTURE AND ITS CONTRIBUTION TO EFFECTIVE PROGRAM MANAGEMENT M.S. Thesis
Gerald A. Christenson and James C. Klorne 15 Sep. 1972 172 p refs
(AD-750849; SLSR-27-72B) Avail: NTIS CSCL 15/5

Government contracting personnel have had a history of accepting a procurement procedure which appeared to be successful in past program and erroneously applying those same procedures to new and different programs. The F-15 contract contains some new and some uniquely applied standard contract clauses. These clauses were described, analyzed, and presented independently in the thesis. After the independent study of the clauses, a summary of the interrelatedness of these clauses was presented. The author's interpretation of what external factors influenced the F-15 contract and how the F-15 contract philosophy evolved are also presented. The authors have made recommendations which apply to the future use of the F-15 contract clauses. Author (GRA)

N73-15976# Stanford Univ., Calif. Electronics Lab.
[ELECTRONIC EQUIPMENT AND SYSTEMS RESEARCH] Semiannual Status Report, 1 Jan. - 30 Jun. 1972
30 Jun. 1972 130 p refs Sponsored in part by Army and AF
(Contract N00014-67-A-0112-0044)
(AD-750669; SU-SEL-72-035; SASR-122) Avail: NTIS CSCL 05/2

Contents: Plasma physics and quantum electronics; Radioscience; Integrated circuits; Solid state; Information systems; Digital systems. GRA

N73-15977# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

THE INTERRELATION OF LOGISTICS COSTS IN MANAGING THE NICKEL CADMIUM BATTERY PROGRAM M.S. Thesis

Frank R. Bartlett and Leo J. Brennan 15 Sep. 1972 88 p refs

(AD-750907; SLSR-3-72B) Avail: NTIS CSCL 15/5

Logistics costs are the summation of all costs associated with the four facets of logistics: procurement, supply, transportation and maintenance. Optimization of one of these logistic facets can result in the suboptimization of total logistics costs. The thesis evaluates the effect of a change in maintenance concept in the management of nickel cadmium batteries. It evaluates logistics costs during two phases of management and projects costs based upon a third management concept. Graphic presentations serve to illustrate the effect of these management changes on total logistics costs. Conclusions are drawn and recommendations made to improve logistics management.

Author (GRA)

PUBLIC COLLECTIONS OF NASA DOCUMENTS

DOMESTIC

NASA deposits its technical documents and bibliographic tools in eleven special regional libraries located in the organizations listed below. Each library is prepared to furnish the public such services as reference assistance, interlibrary loans, photocopy service, and assistance in obtaining copies of NASA documents for retention.

CALIFORNIA
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Systematic Control of Nonmetallic Materials for Improved Fire Safety (NASA SP-5109)

This technology utilization report discusses a systematic means of assuring that nonmetallic materials used in a given application are not hazardous. It was developed by the Manned Spacecraft Center to enhance the safety of the Apollo spacecraft and it can be adapted to many other situations to minimize hazards of fire and offgassing of nonmetallic materials. *Paperbound.* 40 pp. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, for $0.45.

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